Plot-XY
User Manual

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Chapter 1

Introduction

What is Plot-XY and where did it come from?

Plot-XY is generic two-dimensional plotting application that is a part of the SIMDIS™ 3D Visualization and Analysis Toolkit. SIMDIS and Plot-XY were created under the Electronic Warfare (EW) Modeling and Simulation Branch, Code 5770, of the Tactical Electronic Warfare Division (TEWD) of the Naval Research Laboratory (NRL). As the corporate research laboratory for the Navy and Marine Corps, NRL conducts a broad program of scientific research, technology and advance development. Under direction of the Office of Naval Research, NRL's code 5770 has prototyped, produced, and delivered the SIMDIS 3D Visualization and Analysis Tool to the DoD community. Plot-XY is one of many applications delivered with the SIMDIS Toolkit. To learn more about SIMDIS please refer to the SIMDIS User Manual.

1.1 What is Plot-XY?

Plot-XY is an OpenGL based application created to graph two-dimensional sets of Time Space Position Information (TSPI) data, telemetry data, discrete events, as well as calculations between objects containing TSPI data. The application is government off the shelf (GOTS) software developed by NRL's SIMDIS team and targeted for PC and Linux workstations that support hardware accelerated graphics through the OpenGL library.

Plot-XY provides full support for the SIMDIS Plug-in Application Programming Interface (API), which allows users to create software extensions to interact directly with Plot-XY. The software is distributed with plug-ins to read data from SIMDIS ASCII Scenario Input (ASI) files, from the SIMDIS Data Client Server (DCS) protocol, and from various SuperPlot file formats. (SuperPlot was the precursor to Plot-XY.)

Plot-XY provides a native data file format that can be saved and reloaded. However, this format is written by Plot-XY. In order to insert data into Plot-XY, users must still interface with Plot-XY

via the plug-in API.

Users are able to extensively customize both the graphical user interface (GUI) to Plot-XY, as well as the way data is displayed within the program. Plot-XY can generate human-readable Plot-XY Extended Markup Language (PML) scripts, which can later be loaded to re-create saved plot setups. These files can be modified with a standard text editor or through any commercial XML editing software. In addition, an XML Schema document is included with the distribution to help with the development of PML scripts from scratch.

Several features were implemented in Plot-XY to provide maximum support in a range environment. The application was developed for maximum flexibility. Any column of data can be plotted against any other column of data or against time. Plots can be oriented with the origin at any location. The positive directions of the axes can also be adjusted, allowing for quick and simple graphing from left to right and right to left. Support has been added to plot calculated data, such as slant range or altitude difference. Plot-XY supports geographic and relative overlays by implementing a parser for the Generalized Overlay Graphics (GOG) format used at many Navy ranges.

Plot-XY is an object-oriented program written in ANSI C++. The application uses a cross-platform GUI to enable the identical "look and feel" and execution across all supported platforms. The current version achieves this goal on the following hardware and operating system configurations:

- Sun Workstations with Solaris 8 and 9
- PCs running Linux Red Hat Workstation 3, and Fedora Core 2 and 3
- PCs running Windows 2000 and XP.

As a note, these are the system configurations and hardware that the SIMDIS team has to compile and test. Plot-XY may work on other configurations, but such configurations are not supported.

1.2 About This Document

The diagrams throughout the document come from a variety of platforms and versions of Plot-XY. Do not be surprised if they differ slightly from your version of Plot-XY, especially if you have an older version of the software.

The colors and fonts used in this document have specific meaning. Blue will denote a hyper-link to a web site (e.g. the SIMDIS website). `This font will denote user input in a shell or output to the console`.

Direct any comments or questions you may have to the SIMDIS team to
`simdis@enews.nrl.navy.mil`.

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Chapter 2

Installation

Where can I get Plot-XY and how do I put it on my computer?

Plot-XY is available for free download on the SIMDIS website (https://simdis.nrl.navy.mil/). Because Plot-XY now comes with the SIMDIS Toolkit, to obtain Plot-XY one must download SIMDIS. However, in order to do so one must be a registered user. To register, simply go to the website and follow the ***Please register HERE*** link and fill out the pertinent information. While the main distribution does not require a U.S. Government point of contact, users looking to have access to certain tools (such as those used at PMRF and SCORE) need to have a contact to gain access to those tools.

Because Plot-XY is a part of the SIMDIS download, the system requirements and instructions for Plot-XY are identical to those of SIMDIS. In the following sections we have duplicated the system requirements and installation instruction sections of the SIMDIS User Manual.

2.1 System Requirements and Installation Instructions

Currently SIMDIS is supported on three different platforms: Linux, Solaris, and Windows. The following sections detail the system requirements and the installation instructions for each platform. SIMDIS may run on variants of the operating systems listed here, however we are only able to support those platforms for which we have the physical hardware and operating system installed.

The minimum system requirements are:

- 512 MB RAM
- 700 MB free disk space
- Ethernet card
- Hardware accelerated OpenGL graphics card

The recommended system requirements are:

- 1 GB RAM
- 60 GB free disk space for terrain and imagery database files
- Ethernet card
- NVIDIA hardware accelerated OpenGL graphics card

2.1.1 Linux

On the Linux platform, the supported operating systems are Red Hat Enterprise Workstation 3 and Fedora Core 2 and 3. An Ethernet card is required. The SIMDIS license key is tied to the MAC address. When installing SIMDIS, if a zero is given for the computer ID and an Ethernet card is installed, make sure the Ethernet card is configured (`ifconfig -a`).

Installation Instructions

1. Create an installation directory and verify read/write permissions.
2. Copy the `NRL_SIMDIS_v9.0_x86-linux.tar.gz` file to the installation directory.
3. Decompress the archives: `gzip -d NRL_SIMDIS_v9.0_x86-linux.tar.gz`
4. Extract the data: `tar xvf NRL_SIMDIS_v9.0_x86-linux.tar`
5. Install the program: `./installSIMDIS`
6. Logout then log back in.

SIMDIS is now ready to use.

Example Commands

To create an installation directory (will need root privileges to do this) type:

```
mkdir /usr/local/SIMDIS
```

To allow rw (read write) access for all (will need root privileges to do this) type:

```
chmod 777 /usr/local/SIMDIS
```

To copy archives to the installation directory (assuming archives in /tmp) type:

```
cd /usr/local/SIMDIS
cp /tmp/NRL_SIMDIS_v9.0_x86-linux.tar.gz ./
```

To decompress archives type:

```
gzip -d NRL_SIMDIS_v9.0_x86-linux.tar.gz
```

To extract data from archives (this will extract to the SIMDIS/ directory) type:

```
tar xvf NRL_SIMDIS_v9.0_x86-linux.tar.gz
```

Each user MUST run the installSIMDIS program to set up SIMDIS environment by typing:

```
./installSIMDIS
```

2.1.2 Sparc Solaris

The supported operating systems for the Sparc Solaris platform are Solaris 8 and 9. The graphics boards we use are Creator 3-D, Expert 3-D, and XVR-500.

2.1.3 Installation Instructions

1. Create an installation directory and verify read/write permissions.
2. Copy the `NRL_SIMDIS_v9.0_sparc-solaris.tar.gz` file to the installation directory.
3. Decompress the archives: `gzip -d NRL_SIMDIS_v9.0_sparc-solaris.tar.gz`
4. Extract the data: `tar xvf NRL_SIMDIS_v9.0_sparc-solaris.tar`
5. Install the program: `./installSIMDIS`
6. Logout then log back in.

SIMDIS is now ready to use.

Example Commands

The example commands are identical to the Linux platform example commands except for the file names. Everywhere `x86-linux` appears, replace it with `sparc-solaris`. For example, `NRL_SIMDIS_v9.0_x86-linux.tar.gz` should be `NRL_SIMDIS_v9.0_sparc-solaris.tar.gz`.

2.1.4 Windows

The supported operating systems for the Windows platform are 2000 and XP. A Pentium III 500 MHz or higher is required.

Installation Instructions

To install SIMDIS on a Windows machine, download and execute the installer file labeled `NRL_SIMDIS_v9.0_x86-nt.exe`. This will copy all the necessary files onto the computer and initiate an installation wizard to get SIMDIS setup and ready to go. Follow the on-screen instructions. An installation tutorial is available on the SIMDIS website with step-by-step instructions for installing SIMDIS on a Windows machine.

2.2 Video Cards

SIMDIS requires an OpenGL hardware accelerated AGP or PCI Express graphics card. Any card built before 2000, a PCI card, or any card without OpenGL hardware acceleration will have very slow graphics performance and is not recommended.

Currently any graphics card with the NVIDIA GeForce FX, GeForce 6 series, or GeForce 7 series video chip set is recommended. The NVIDIA chip sets have the best OpenGL performance and work right out of the box.

For OpenGL visualization issues related to ATI graphics cards see http://www.3dnature.com/ati.html.

For reviews on graphics cards see http://graphics.tomshardware.com/graphic/.

For comparison-shopping of video cards see http://neoseeker.pricegrabber.com/search_attrib.php/page_id=5/.

We currently use the following video cards in our own systems:

Workstations	Laptops
• NVIDIA GeForce4 Ti 4600	• NVIDIA GeForce4 4200 Go
• NVIDIA GeForce PCX 5750	• NVIDIA GeForce Go 6800
• NVIDIA GeForce 6800 GT	• NVIDIA Quadro FX Go700
• NVIDIA Quadro FX 1000	• NVIDIA Quadro NVS 120M
• NVIDIA GeForce 7800 GTX	
• NVIDIA GeForce 7800 GTX x2	

2.3 License Key

Every installation of SIMDIS requires a valid license key. The program will not operate without a valid license key. The installation wizard will specify your computer ID number and ask you to go to the website and use this number to obtain the license key. Go to the SIMDIS website, log in, click on Register System, then SIMDIS, and enter the required information in the form (see Figure 2.1). The license key is used for maintenance purposes by the SIMDIS team and allows us to notify users of updates to SIMDIS.

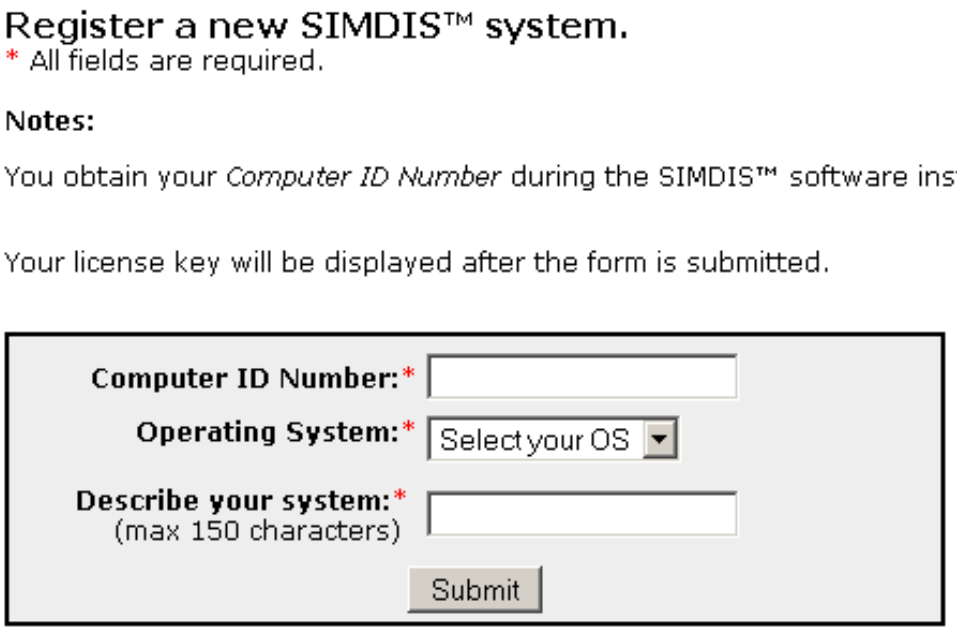

Figure 2.1: SIMDIS License Key Form

2.4 Environment Variables

Plot-XY uses the same environment variables as SIMDIS. The following variables are set during installation:

$(SIMDIS_DIR) - The SIMDIS installation directory

$(SIMDIS_HOME) - The location of the SIMDIS home directory containing SIMDIS preference and rules files

Windows default:

C:/Documents and Settings/USERNAME/SIMDIS

UNIX default:

$(HOME)

$(SIMDIS_LICENSE) - Your SIMDIS license key based on your computer ID number.

$(SIMDIS_USER_DIR) - A user-defined directory for the storage of user data, ex., asi files, gog files, 3-D models, etc. This variable is to be created and set by you. The data stored in this directory will be protected from future SIMDIS updates, installs, etc.

Default:

$(SIMDIS_HOME)

$(SIMDIS_TERRAIN) - The location of the SIMDIS terrain texture and elevation sets. This variable can be changed to use a different directory, e.g. a different drive.

Windows default:

C:/Program Files/SIMDIS/data/sdTerrain

UNIX default:

/usr/local/SIMDIS/data/sdTerrain

2.5 Directory Structure

Plot-XY uses the same directory structure as SIMDIS. Under the `SIMDIS` directory, there are eight directories. Their contents are as follows:

bin - This folder contains the executables for all of the programs in the SIMDIS Toolset. The x86-nt folder shown is for a Windows system. This folder name will vary according to your operating system.

config - This folder holds SIMDIS and third party configuration files that should not be modified

data - This is where data such as terrains, textures, models, and others are stored.

demos - This folder contains various .asi .fct and .spy files that provide as examples of SIMDIS's capabilities

doc - This folder contains the documentation for the programs in the SIMDIS toolset.

install - This folder contains installation logs for the Wise installer. (Windows only)

lib - This folder contains the runtime and Python libraries used by the SIMDIS toolset.

plugins - This is the folder where registered plug-ins are stored.

Chapter 3

Plot-XY QuickStart

How do I get Plot-XY up and running?

Starting the Plot-XY application is a simple task, however, familiarizing oneself with the application may not be. In this chapter we introduce a few basics of Plot-XY through the Plot-XY QuickStart manual. This chapter is included in the user manual as Chapter 3, but is also distributed as a stand-alone QuickStart guide. For a more detailed description of the items described in QuickStart use the designated chapters in the user manual.

3.1 Starting Plot-XY

The Plot-XY executable is located in the same folder as the SIMDIS executable. This is normally found in $(SIMDIS_DIR)/bin. The SIMDIS installer also provides an option for placing the SIMDIS and Plot-XY icons on the windows desktop. Clicking the Plot-XY icon will start the application. Yet another way to start Plot-XY is to type `PlotXY` in a command prompt.

3.2 The Display

Plot-XY will start with no data loaded and an empty plot space (graph) on the display. The application window is divided into a few sections: the menu, the toolbar, the tab bar, the plot canvas, and the status bar. Figure 3.1 identifies many of the key components in the main window of Plot-XY.

The **Menu** provides access to most of the application's functionality. The **Toolbar** is a set of buttons used as shortcuts to commonly used menu items. The **Tab Bar** is located directly below the Toolbar and lists all tabs, each of which contains its own plot canvas. The **Plot Canvas** is the area where all plot spaces exist. A plot space is everything associated with a plot, including the labelling text surrounding it. Each plot space can contain any number of x/y data pairs, or

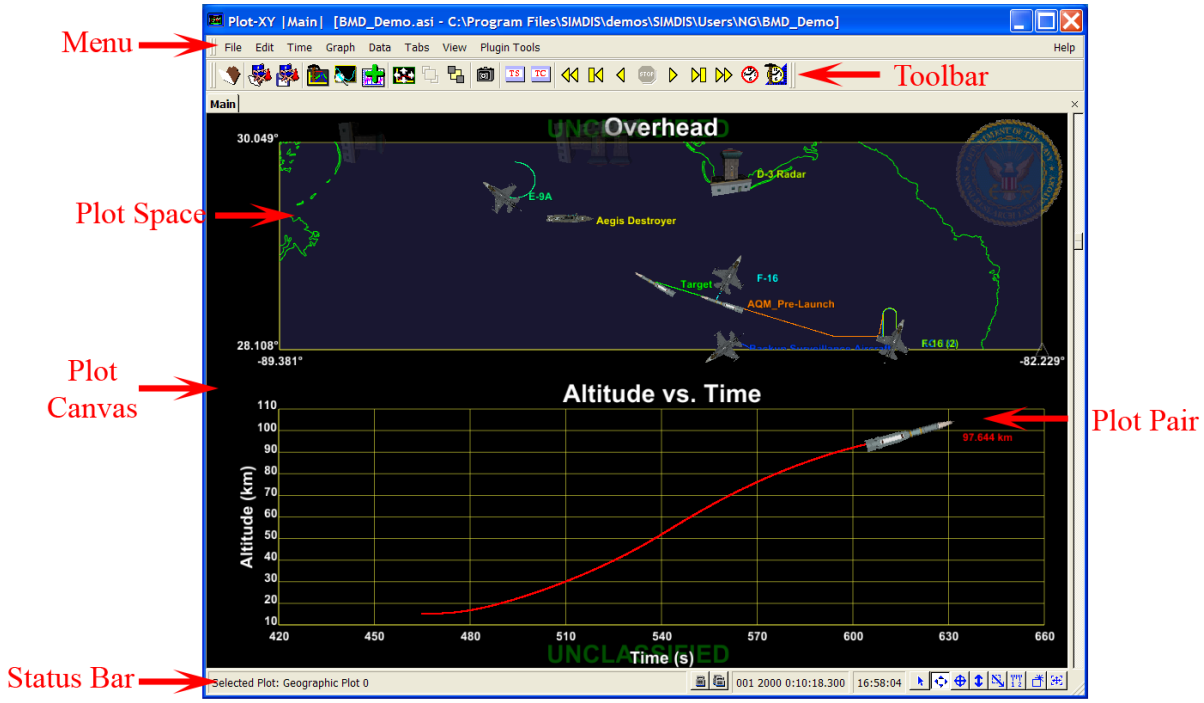

Figure 3.1: Display

plot pairs. Finally, the **Status Bar** displays helpful hints and the current time. Additionally, the status bar also contains editing locks and different mouse modes.

3.2.1 Toolbar

Figure 3.2: Toolbar

The Plot-XY toolbar (Figure 3.2) provides shortcuts to some of the most commonly used tools the application has to offer. Each button on the toolbar from left to right is explained below.

Open File

 opens a file. The file type must be registered by a Plot-XY data plug-in.

Load Script

 loads a script. Scripts are used to save plot space settings, including but not limited to screen location, colors, and plot pairs.

Save Script

 saves the current plot space layout to a script file.

Plot Manager

 opens the Plot Manager window, which controls the settings for each plot space.

Advanced Data Manager

 opens the Advanced Data Manager window, which controls the setting for each plot pair.

Add Data

 opens the Add Plot Pair window, which adds data to a plot space.

Autofit

 automatically fit the data on the currently selected plot space.

Bring to Front

 brings the currently selected plot space to the front in stacking order.

Send to Back

 sends the currently selected plot space to the back in stacking order.

SnapShot

 takes a snapshot of the current display.

Time Server

turns on the TCS Time Server.

Time Client

turns on the TCS Time Client.

Decrease Time Step


decreases the size of the time step, thus slowing down the rate of playback.

Step Back


steps back one time step.

Play Backwards


plays the scenario backwards.

Stop

stops the time progression of the scenario.

Play Forward


plays the scenario forward.

Step Forward


steps forward one time step.

Increase Time Step


increases the size of the time step, thus speeding up the rate of playback.

Real Time

 plays the scenario in real time. If Real Time is already selected, choosing this item will exit real time mode.

Time Editor

 displays the Time Editor dialog. This dialog has all of the time control buttons along with input areas for the time and time step, allowing a user to specify an exact time and time step.

3.2.2 Status Bar

Besides displaying helpful text, the status bar also provides mouse mode options and editing locks as described in this section.

Mouse Modes

Plot-XY supports several different mouse modes (Figure 3.3). The current mouse mode defines the functionality of mouse clicks. Mouse modes are activated by selecting one of the buttons in the far right corner the status bar. Only one mouse mode may be active at a time. The selected mouse mode will determine the function of the mouse left-click as explained below.

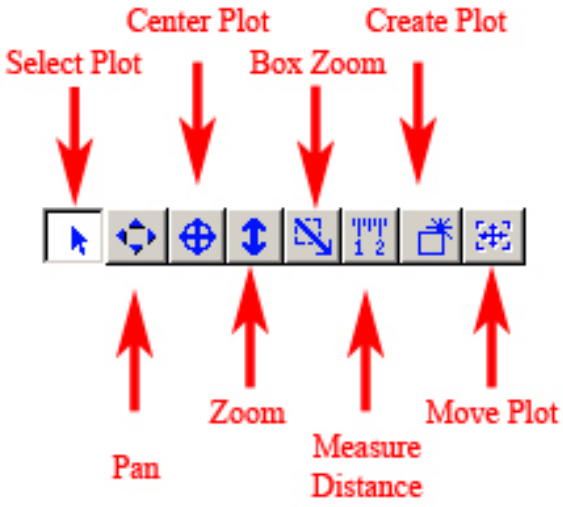

Figure 3.3: Mouse Modes

 Select Plot - selects the plot underneath the cursor. If multiple plots are underneath the cursor, a pop up will appear providing a choice between the plots. Certain actions, such as autofit, only apply to the currently selected plot space.

 Pan - pans through the selected plot by left-clicking and dragging the mouse. This is similar to Adobe Acrobat's hand-scroll motion.

 Center Plot - centers the plot on the location where the mouse is left-clicked.

 Zoom - zooms in and out on the selected plot when left-clicking and dragging the mouse up or down.

 Box Zoom - creates an imaginary box in the selected plot when left-clicking and dragging the mouse. Releasing the left mouse button will zoom in so that the imaginary box represents the plot's extents. Single left-clicks in this mode will re-center the selected plot.

Measure Distance - measures the distance based on units of the plot. Works by left-clicking and dragging the mouse to temporarily draw a line from the click point to the current mouse location, showing the length of the line along each axis.

 Create Plot - creates a new plot space. The x axis has a default positive, increasing direction from left to right while the default direction for the y axis is from bottom to top. In this mode, the user must click, hold, and drag the mouse to draw a box defining the size and location of a plot space to be created. Upon release of the mouse, a pop-up menu prompts the user to select the type of plot space to create. Only after the selection of the plot type is the plot actually created. Using the left mouse button creates a plot whose axes are the size of the box drawn, while using the right mouse button creates a plot where the entire plot (including all text, labels, etc.) fits within the drawn box.

 Move Plot - selects a plot with a single left click. The currently selected plot will have a border around it, with eight control points: one on each corner, and one in the middle of each side. Dragging control points will change the width or height of the graph. This mode can be used to flip graphs from horizontally and vertically, thus flipping the positive, increasing direction of the axes. Clicking and dragging anywhere within the graph that is not a control point will move the plot's location on the screen.

Locks

There are two types of locks that can be enabled in Plot-XY. These locks are helpful for restricting user control to making unwanted changes. Typically, after a setup has been created, both locks are turned on in operation mode where none of the plots should not be altered. Below is a description of the locks available in Plot-XY.

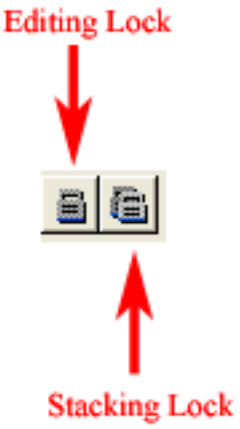

Figure 3.4: Mouse Control Locks

 Editing Lock - prevents any axis bound, translation, and resizing changes by the mouse. This lock is typically used in a setup where there should be no user interaction. When turned on, mouse modes for zooming, panning, resizing, and moving the plot will be disabled. However, adjusting these settings is still possible using the Plot Manager Dialog as discussed in Chapter 7.

 Stacking Lock - prevents any stacking order changes by the user. During creation of overlapping plots, this mode is useful to prevent unwanted changes to stacking order after an order has been set. When turned on, the user cannot change the stacking order of any plots through the either mouse or Plot Manager.

3.3 Loading Data

In order for Plot-XY to graph anything, the application needs data. Plot-XY can use either file-based data or network-based data. Plot-XY does not provide any native support for loading data; in other words, all data must be read by a plug-in, which in turn adds data into Plot-XY. The ASI Loader plug-in is included with Plot-XY to allow users to read the ASI file format used by SIMDIS. More information on the differences between file and network data is found in Chapter 5.

3.3.1 Loading File-Based Data

To load file data, Plot-XY must have a plug-in loaded that has registered a file-type with the application. The ASI Loader plug-in should install by default. Open a file with Load Data File Dialog (Figure 3.5) via the Open menu item in the File menu. Be sure to select the correct File Filter, as this is what determines which plug-in will be used to read the file. Once a file is open,

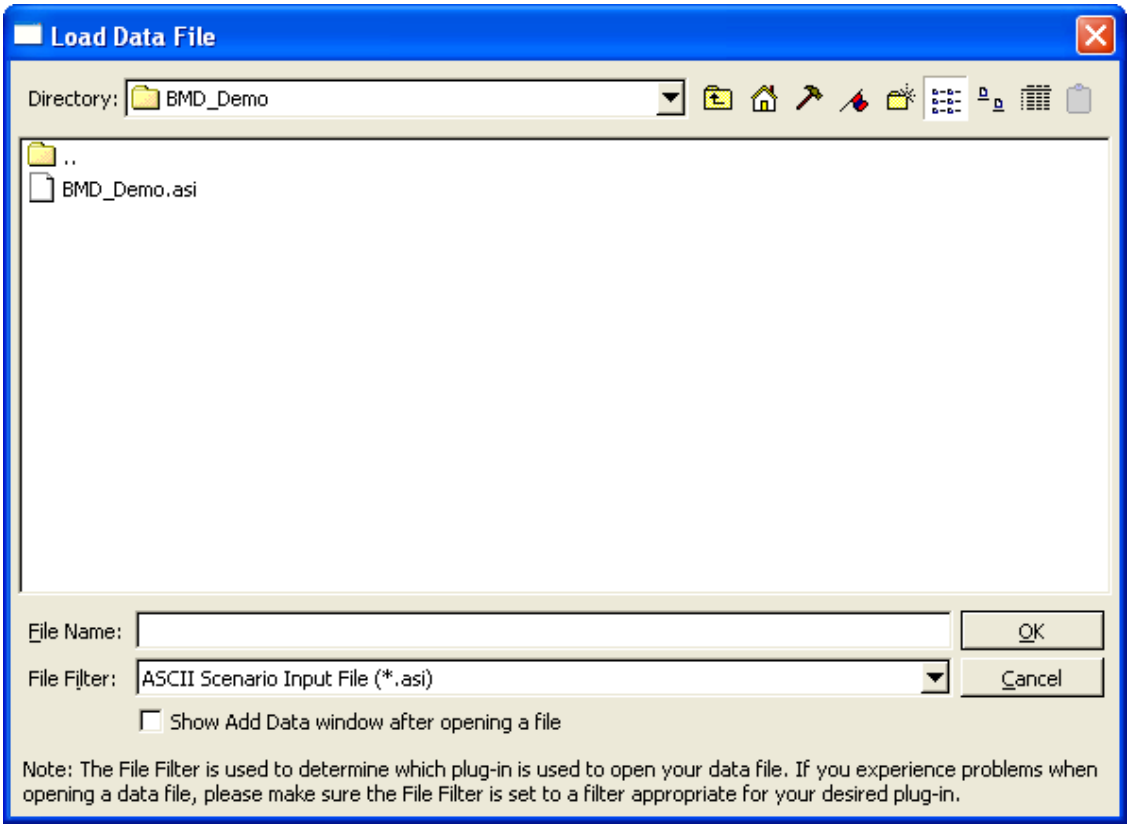

Figure 3.5: Loading a File

data from the file must be added to a plot space in order to visualize it. Creating plots and adding data is discussed in Sections 3.4 and 3.5.

3.3.2 Loading Network-Based Data

Opening a network connection is more complex than opening a file. Plot-XY must rely on the network reading plug-in to gather necessary parameters for a network connection. Therefore, different network source protocols will most likely have different user interfaces.

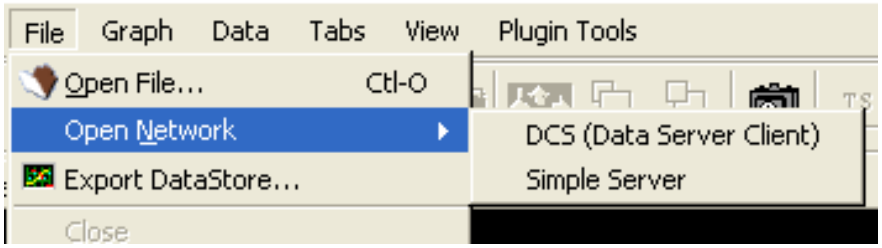

Figure 3.6: Loading Network Data

Plot-XY provides a convenient drop down menu (Figure 3.6) to select the desired network protocol plug-in. Selecting an item in the Open Network menu will display a plug-in window that can be configured to initialize the network connection. Once connected, data can be added to plots.

3.4 Creating a Plot

A new plot space can be made by using the Create Plot mouse mode or by selecting a plot type from the Create Plot menu item in the Graph or Right-Click menu. When using the Create Plot mouse mode, left-click and drag the mouse to create a plot. When the mouse button is released a context menu will appear with a list of the plot types as shown in Figure 3.7.

Scatter Plots are the typical X versus Y graphs. This plot type can be used to plot any X versus any Y parameter. Parameters can be time, a range calculation between two tracks, or any columnar data element associated with an object such as latitude or speed. See Figure 3.8 for an example of a latitude versus longitude scatter plot.

A **Geographic Plot** displays the latitude versus longitude location of every track in a top-down-north fashion. A geo plot is a scatter plot with latitude on the y axis and longitude on the x axis. The main difference between geographic plots and latitude versus longitude scatter plots is that geographic plots do not allow users to add or remove data. Any and all data found in Plot-XY is displayed in a geographic plot. However, users may hide certain track from being displayed on a geographic plot. See Figure 3.9 for an example of a geographic plot.

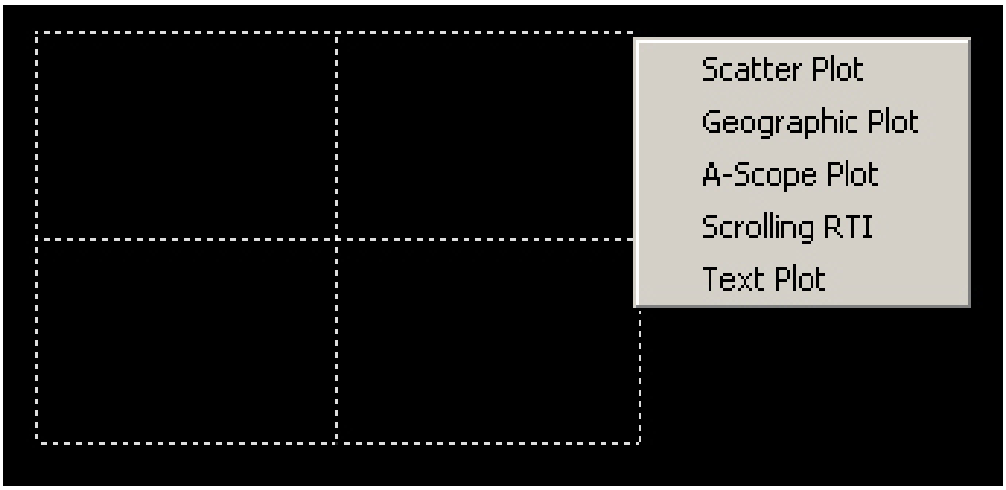

Figure 3.7: Creating a Plot

An **A-Scope Display** is used to display array-based data such as radar returns. See Figure 3.10 for an example of an a-scope graph. For more information see Chapter 6.1.1.

A **Range Time Intensity (RTI) Plot** displays the time history of an A-scope plot using a color gradient to represent signal intensity. See Figure 3.11 for an example of an RTI graph. More information can be found in Chapter 6.1.1.

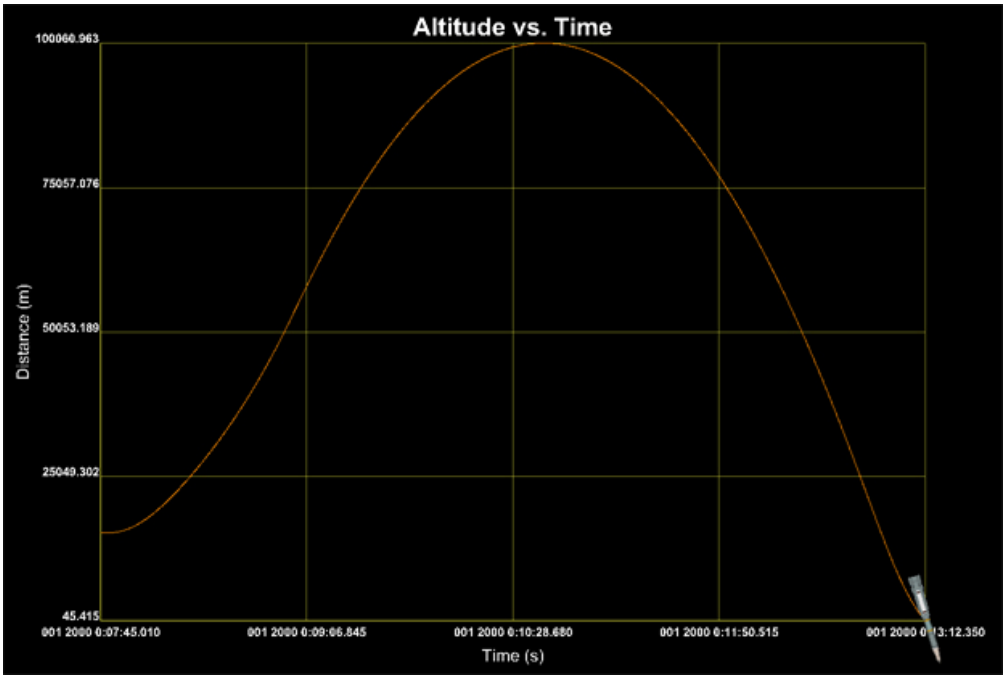

Figure 3.8: Example Scatter Plot

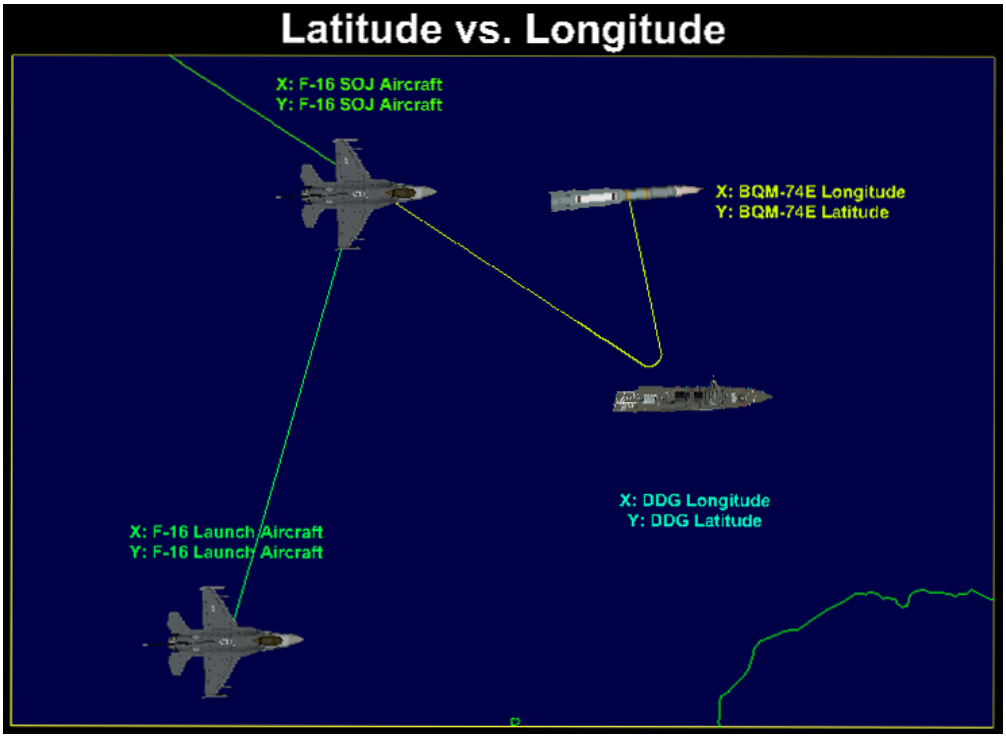

Figure 3.9: Example Geographic Plot

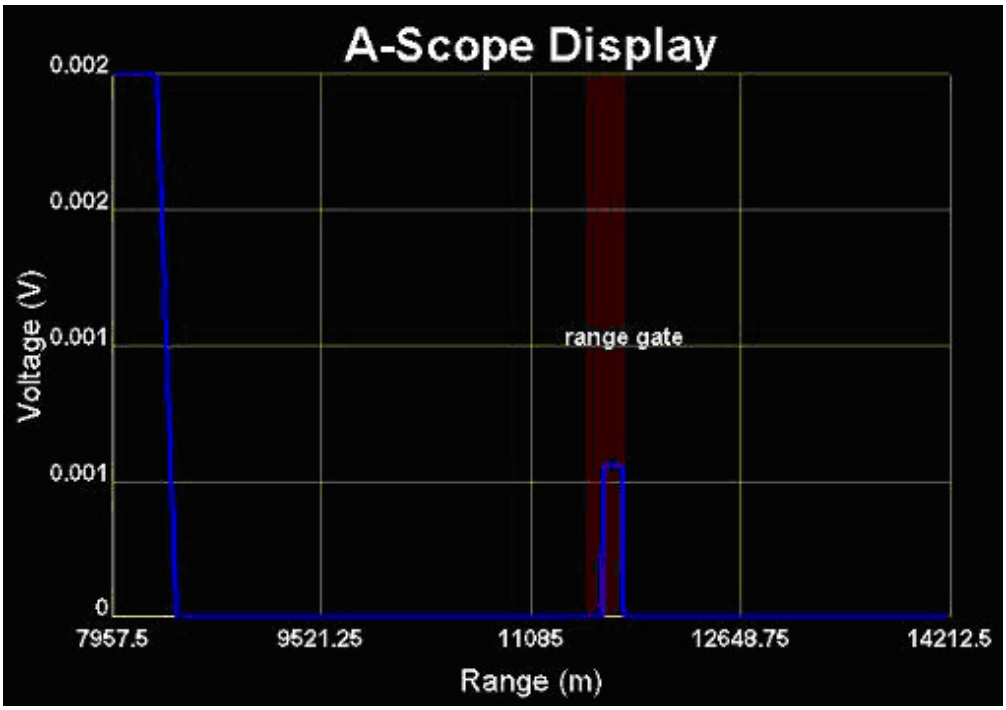

Figure 3.10: Example A-Scope Display

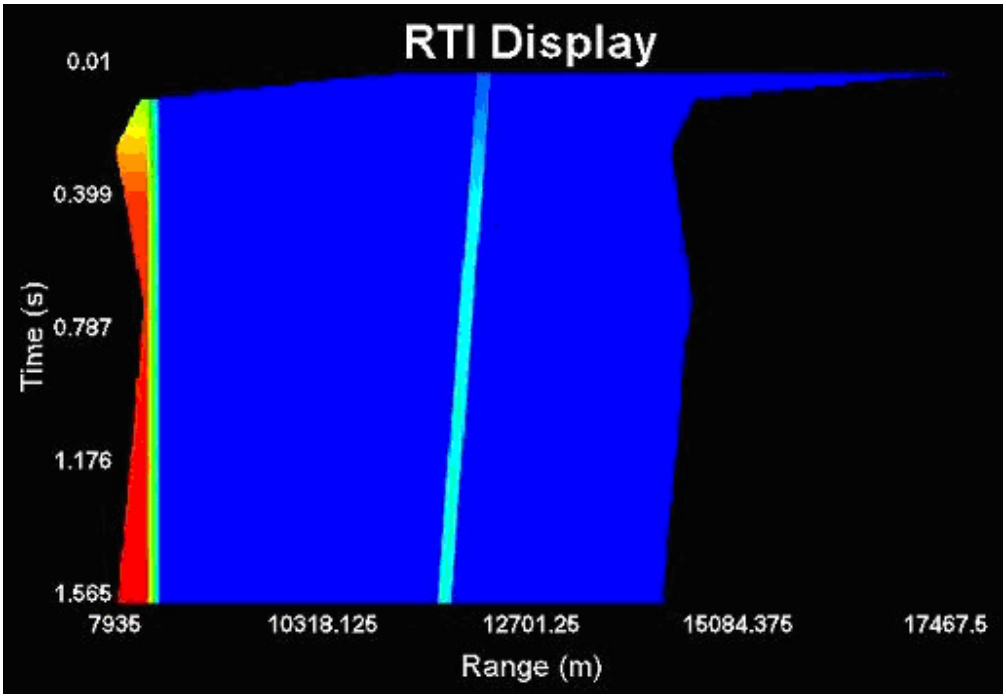

Figure 3.11: Example Scrolling RTI Plot

A **Text Plot** is used to display data in text format. See Figure 3.12 for an example of a text plot.

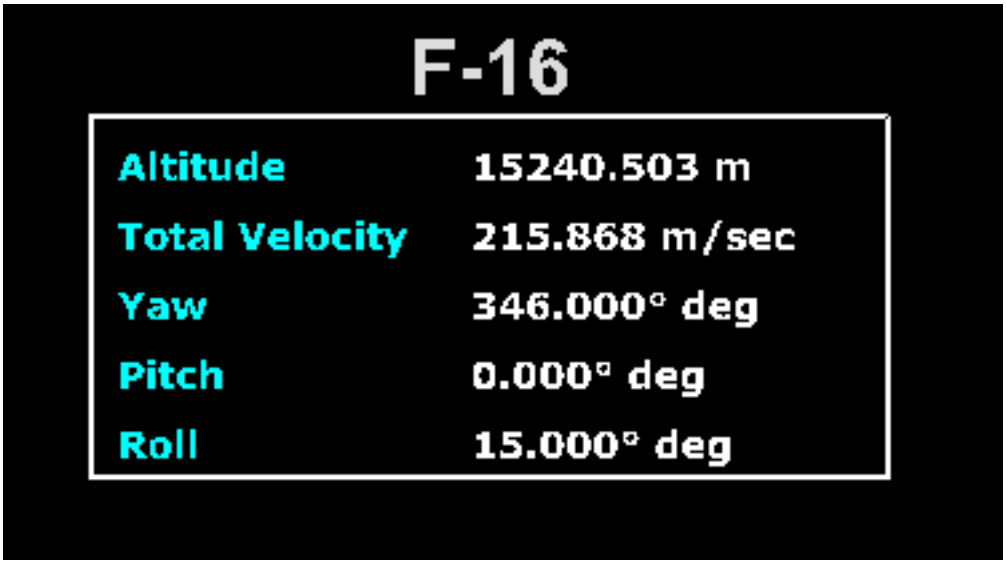

Figure 3.12: Example Text Plot

3.5 Adding Data to Plots

Once scenario data is loaded and a plot has been created, the application is ready to plot data. Data is added to existing plot spaces by using the Add Plot Pair window (Figure 3.13). Graph lines are referred to as "plot pairs" to indicate that the data for the graph line comes from a pairing of two distinct data columns.

The Add Plot Pair window changes slightly for each plot type, allowing for plot pair creation that is specific to the type of plot. Multiple plot pairs may be added at once by selecting multiple items.

3.6 Adjusting Plot Spaces

Plot Spaces can be customized to provide auto-fit, one-to-one, and round ranges options to better display the data present. Auto-fit will move the axes of the display so that all the data fits within the plot space at the closest zoom level possible. One-to-one will force each axes to use the same scale. Round ranges will attempt to expand the graph area so that the grid lines fall on well rounded numbers (i.e. 2.0, 45.25, not 23.9842). These options are available via the Graph and Right-Click menu.

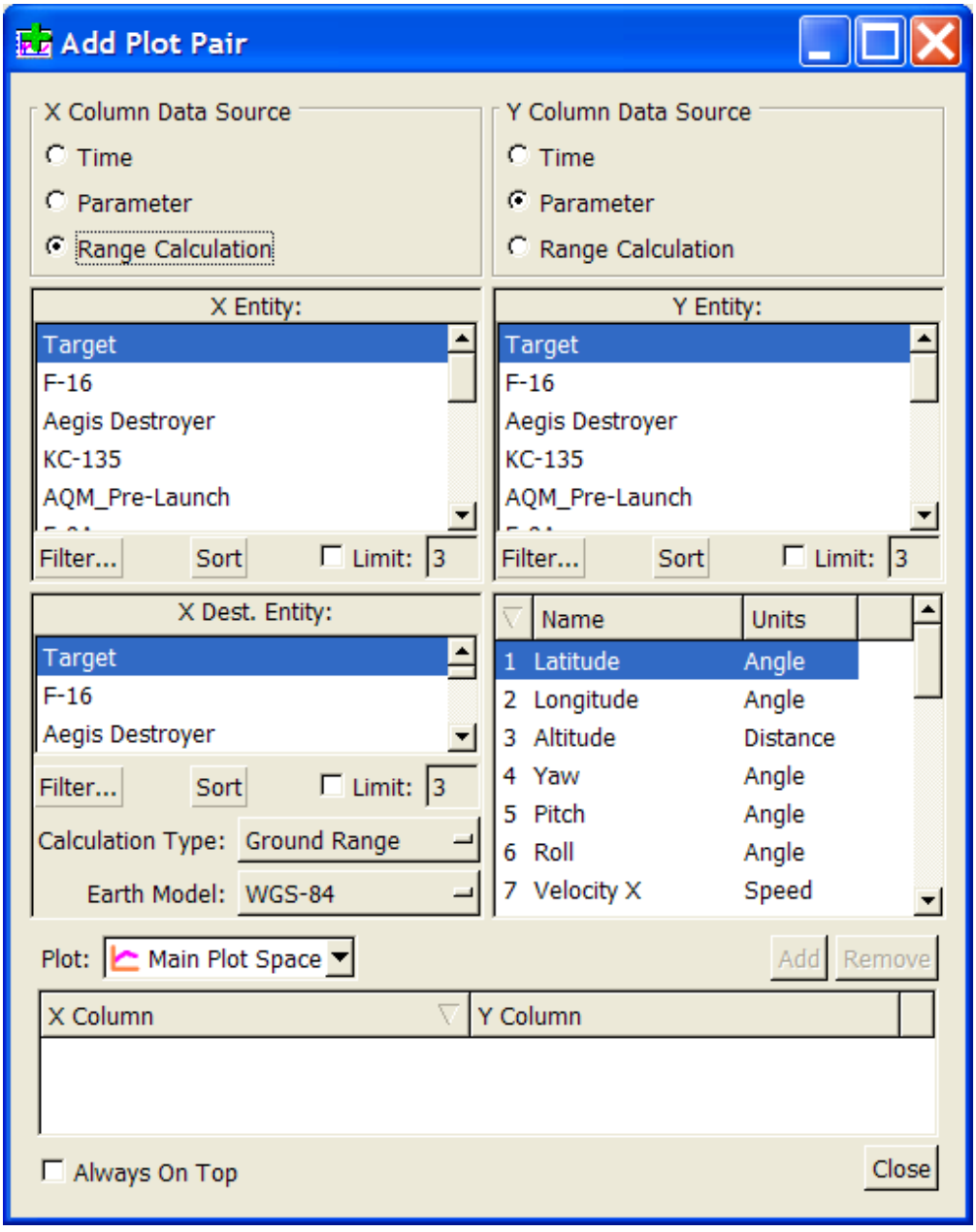

Figure 3.13: Add Plot Pair Dialog

Mouse modes provide the ability to zoom, pan, and center within a plot. The entire plot itself can also be moved and resized using the appropriate mouse mode.

All other options including, but not limited to axes and grid settings, size and position, text labels, and plot colors are available via the Plot Manager Dialog (Figure 3.14).

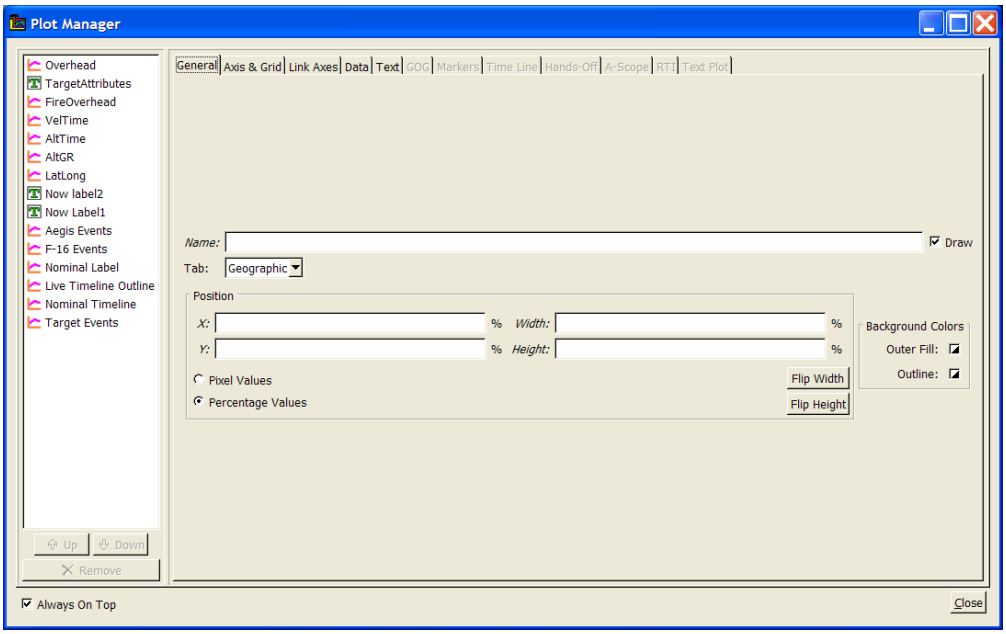

Figure 3.14: Plot Manager Dialog

3.7 Preference Files

Many of the options within Plot-XY can be preset and saved to a preferences file. There is a factory settings preferences file included with Plot-XY called `plotxy.prefs`, stored in the installation directory and copied to the $(SIMDIS_HOME) directory during set-up. Instead of changing any of these preferences directly, it is highly recommended that a second preference file in the same $(SIMDIS_HOME) directory with the filename `myplotxy.prefs` be created. When a new version of SIMDIS is installed, `plotxy.prefs` will be overwritten with the factory version, however, `myplotxy.prefs` will remain intact. These preference files are both human readable and contain comments explaining what each section of the preference file does, allowing for easy editing of the preferences files. Preferences can also be set through the Plot-XY user interface by selecting the Options item in the Graph menu.

3.8 Plot-XY Help

The Plot-XY menu bar provides a help menu with access to a help document, the SIMDIS website, and system information regarding the copy of Plot-XY and computer running the application.

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Chapter 4

The Plot-XY Tool Bars

What can I do with the Plot-XY Toolbars?

From the tool bars in the application, one can load data and subsequently create a visually pleasing, graphical display of the data using an abundance of two-dimensional plots. There are four tool bars in the Plot-XY application: the Menu Bar, the Toolbar, the Tab Bar, and the Status Bar. Each tool bar has different options and tasks. The following sections explain each of the tool bars.

4.1 Menu Bar

The menu bar illustrated in the Figure 4.1 is the top most tool bar. There are eight items in the menu bar, each containing submenus. The following sections describe each of the items found in the submenus.

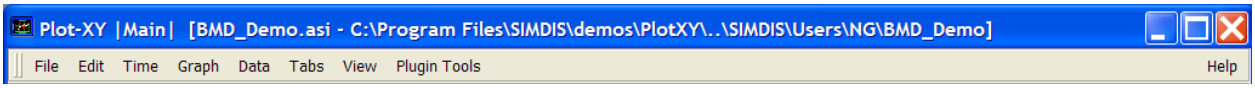


Figure 4.1: Plot-XY Menu Bar

4.1.1 File

The File menu (Figure 4.2) is used to open data sources, load and save scripts, load and save preferences, and quit the application.

Open File...
This option opens an existing data file into Plot-XY. Because data is mostly controlled by plug-ins, the File Filter option determines the types of files to open and which plug-in will open the data. The valid file formats are:

Plot-XY DataStore Files (`*.pxy`)

- SuperPlot Plot Files (`*.asp, *.binplot, *.bsp, *.plot`)
- SuperPlot Time Slice (`*.asg, *.bingraph, *.bsg, *.graph`)
- SuperPlot Time Slice Block (`*.binblock, *.bsb`)
- Excel CSV File (`*.csv`)
- All SuperPlot Files (`*.asg, *.asp, *.binblock, *.bingraph, *.binplot, *.bsb, *.bsg, *.bsp, *.csv, *.plot, *.graph`)
- ASCII Scenario Input File (`*.asi`)

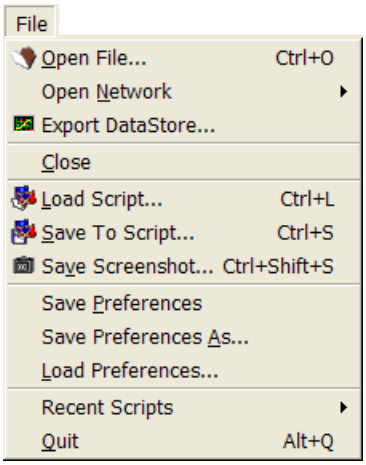


Figure 4.2: File Menu

Open Network ▶

When the mouse pointer is over the Open Network option, another menu appears with several items depending on the plug-ins loaded in the current instance of Plot-XY. Selecting an item in the open network list will connect to a network data source through a plug-in. Establishing a network connection via the File menu may appear slightly different, however, than connecting via a plug-in from the Plug-in Tools menu. This is because using the File menu will set the plug-in defaults to network configuration, which one may have to do manually if establishing a connection by activating the plug-in manually (through the Plug-in Tools menu). The default network data sources are: Simple Server and DCS (Data Server Client). However, one might see more depending upon the plug-ins loaded into the current instance of Plot-XY.

Export DataStore...

This option will export all data in Plot-XY to an PXY Data Store file format (`.pxy`). PXY files will save your current data and your current screen configuration to a single file that you can load and review later.

Disconnect/Close

The fourth item in the File menu will either read Disconnect, Close, or be omitted depending on the state of Plot-XY. Upon starting the application the fourth item is skipped (Load

Script... is the fourth item) because neither a file is opened nor a network connection established. If a file is opened, the fourth item is Close and selecting the option will close the data file. If Plot-XY is reading data from a network, the fourth option is Disconnect. Selecting disconnect will do exactly that: disconnect Plot-XY from the network.

Load Script...
Selecting this item opens the Load Configuration Script dialog. Plot Configuration scripts have the extension `.pml` or `.xml`. For more information on scripting see Chapter 10.

Save To Script...
The Save to Script menu item opens a dialog providing the option to save different sections of Plot-XY to a script. Clicking the save button at the bottom of the dialog will bring up another window to specify the name and extension of the script. For more information on scripts see Chapter 10.

Save Screenshot...
Clicking this menu item saves an image of the current Plot-XY plot area. A dialog will pop-up to name and choose where to save the screen shot. Screenshots can be saved as `.png`, `.jpg`, or `.tiff` files.

Save Preferences
Selecting the save preferences item will re-write the `myplotxy.prefs` file located in the Home directory. Any current preferences will be saved for the next time Plot-XY is opened.

Save Preferences As...
Whereas Save Preferences re-writes the default Plot-XY preference file, the Save Preferences As... menu option re-names a preferences file.

Load Preferences...
This menu item loads a preferences file other than the default Plot-XY preferences file, although the default preferences file can be loaded here as well.

Recent Scripts ▶
Similarly to the above menu item, placing the mouse of the Recent Scripts item will pop-up a submenu listing recent scripts loaded into Plot-XY. The first time Plot-XY is run, the submenu will be empty. The submenu will be populated as scripts are loaded into Plot-XY. It may be emptied by choosing the **Clear recent scripts** option at the bottom of the submenu.

Quit
Selecting the Quit item will exit the Plot-XY application.

4.1.2 Edit

The Edit menu (Figure 4.3) is used to manage and arrange existing plots. Each item in the menu is described in detail below.

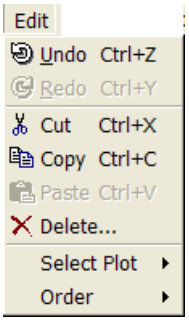


Figure 4.3: Edit Menu

Undo
This item will undo the last axis bound, location, and size adjustment(s) performed.

Redo
This item will redo the last undo action performed.

Cut
This item will cut the currently seclected plot, allowing for the plot to be pasted on the currently active tab.

Copy
This item will copy the currently selected plot, allowing for the plot to be pasted on the currently active tab.

Paste
This item will paste the plot space that was last cut or copied on the currently active tab. The active tab is the tab that is currently showing.

Delete
This item will delete the currently selected plot.

Select Plot
This item will bring up a submenu that lists of all the plot spaces on all the tabs. The currently selected plot is the plot with the check next to it in this menu. Clicking on a plot will select the plot only if the plot is in the current tab. To select a plot in a different tab, switch to that tab first. The plot with the check next to it in this menu is the currently selected plot.

Order

This item will bring up a submenu containing commands to adjust the stacking order of plots. Stacking options are only available if there is more than one plot. The submenu also contains options to automatically tile *alignandresize* the plots on the currently active tab automatically, in either one row of mutliple plots of the same size, or one colomn of multiple plots of the same size.

4.1.3 Time

The Time menu (Figure 4.4) is used to control the time. Each item in the menu is described in detail below.

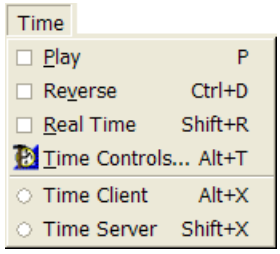


Figure 4.4: Time Menu

Play
This item will continuously increment the time forward when Plot-XY is in file mode.

Reverse
This item will continuously increment the time backwards when Plot-XY is in file mode.

Real Time
This item will force playing forwards and backwards to be done in real time despite the current time step.

Time Controls...
This item will display the Time Editor dialog, which has all of the time control buttons along with input areas for the time and time step. The Time Editor provides the functionality to specify an exact time and time step. For more information on the Time Editor see Chapter 8.

Time Client
This item will make Plot-XY a time client. It will only affect the time of Plot-XY if another application is the time server (this application will have control over time, whereas Plot-XY will relinquish its control of time). Notice how the time controls (described below) become inactive when Plot-XY is a time client.

Time Server
This item will make Plot-XY a time server. Plot-XY will then control the time of other time client applications, such as SIMDIS. See Chapter 8.3 of the SIMDIS User Manual for more information on Time Server and Time Client.

4.1.4 Graph

The Graph menu (Figure 4.5) is used to create and manage plots in the Plot Canvas. Each item in the menu is described in detail below.

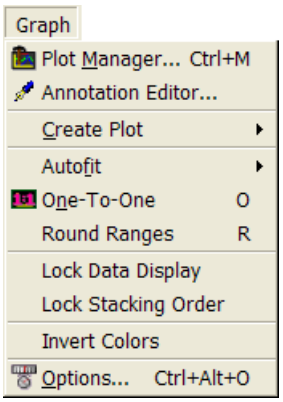


Figure 4.5: Graph Menu

Plot Manager...
Selecting this item will open the Plot Manager dialog, which allows for the configuration any of the plots currently in Plot-XY. For more information on the Plot Manager dialog see Chapter 7.

Annotation Editor...
Selecting this item will open the Annotation Editor dialog, providing the functionality to add, modify, and delete text overlays in Plot-XY. For more information on the Annotation Editor see Chapter 8.

Create Plot ▶
Moving the mouse over the Create Plot item will bring up a submenu where one can select the type of plot to create. Choosing a plot type will then create a graph the full size of the plot canvas. For more information on various plot types see Chapter 6.

Autofit ▶
Mousing over the Autofit item will bring up a submenu of autofit options. Generally speaking, autofit changes the extents of the current selected plot so that all platforms in the plot are visible. The first item in the submenu, Autofit, does this. To only change the range of a plot in the X or Y direction only, select **Autofit X Only** or **Autofit Y Only**, respectively.

One-To-One
The One-To-One menu item will change the extents of the currently selected plot by making the aspect ratio of the X- and Y- axes a one-to-one aspect ratio. This option is especially helpful for geographic plots.

Round Ranges

Selecting the Round Ranges item will expand the graph area for the selected plot in an attempt to maintain the current display and replace the extents with a "smooth" gradient of numbers. In other words, the bounds and increments for the axes will be changed to "round" numbers such as 8.0 or 8.5 as opposed to 8.352.

Lock Data Display

This menu item is a toggle button that will either lock or unlock the data display. Locking the data display prevents any accidental mouse-enacted changes to the display. Notice the left lock button in the middle of the status bar changes as this menu item is toggled. All tabs are affected by this option.

Lock Stacking Order

The lock stacking order menu item has a similar affect. It is a toggle button that will lock and unlock the stacking order of the plots on all tabs. When the stacking order is locked, the first four submenu items in the order menu are grayed out and unavailable. Notice the right lock button in the middle of the status bar changes as this menu item is toggled. All tabs are affected by this option.

Invert Colors

This menu item will invert the colors (colors become their opposite) in the Plot-XY plot canvas. All tabs are affected by this option.

Options...

Clicking the Options menu item will bring up the Options dialog in Plot-XY. For more information on this dialog see Chapter 8.

4.1.5 Data

The Data menu (Figure 4.6) is used to open the various Plot-XY dialogs that handle data. There are six items in the Data menu that are described below.

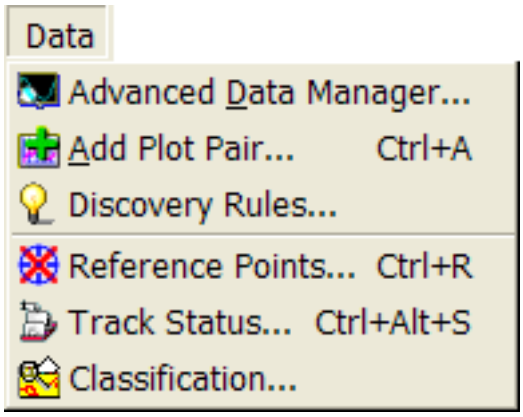


Figure 4.6: Data Menu

Advanced Data Manager...
This menu item brings up the Advanced Data Manager dialog, which controls how plot pairs are displayed in a graph. For more information on the Advanced Data Manager see Chapter 7.

Discovery Rules...
This menu item brings up the Discovery Rules dialog, which allows users to specify rules to allow for plots to automatically add data as data is received. For more information on Discovery Rules see Chapter 6.2.2.

Add Data...
This menu item brings up the Add Plot Pair window, which adds data lines to a plot space. For more information on the Add Plot Pair window see Chapter 6.2.1.

Reference Points...
Selecting this menu item will bring up the Reference Point Manager dialog. This dialog provides the functionality to create, edit, and remove reference points from Plot-XY. For more information on reference points and the Reference Point Manager see Chapter 9.

Track Status...
Selecting this menu item will bring up the Track Status Dialog. For more information on the Track Status Dialog see Chapter 8.

Classification...
This menu item brings up the Classification dialog that is used to set the classification type of the current use of Plot-XY. For more information see Chapter 8.

Flush Data

This menu item is only available in network mode. Selecting it will remove any data history stored in Plot-XY.

4.1.6 Tabs

The Tabs menu (Figure 4.7) is used to create, edit, and delete tabs, as well as, navigate tabs and move plots between tabs. Each item in the menu is described below.

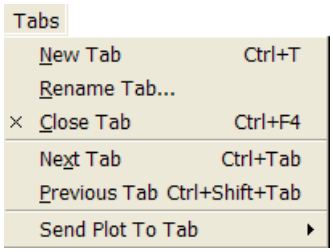


Figure 4.7: Tab Menu

New Tab

Selecting this menu item will create a new tab with a default name and no plots. To change the name of the tab use the Rename Tab menu item.

Rename Tab...

This menu item will gives the option of renaming the currently selected tab by opening a dialog (Figure 4.8). Simply enter the new name and click the **OK** button. This dialog can also be accessed by double clicking the tab you want to rename.

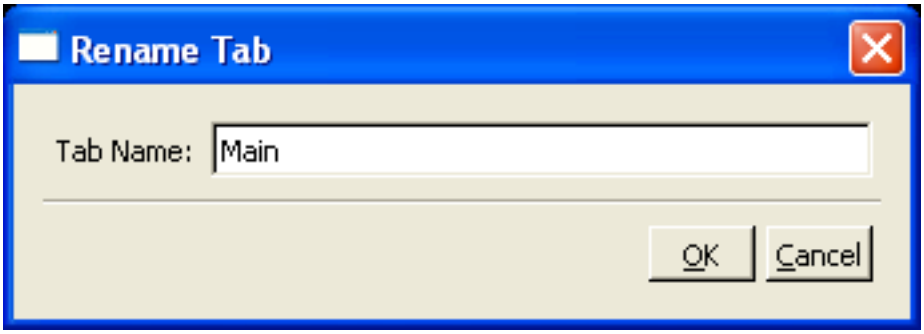


Figure 4.8: Rename Tab

Close Tab

Selecting this menu item will delete the current tab and any plots on that tab. Be careful because this is a permanent option!

Next Tab
This menu item navigates forwards through the various tabs created.

Previous Tab
Similarly, this menu item navigates backwards through the various tabs.

Send Plot To Tab ▶
This menu item opens a submenu with a list of all the current tabs in Plot-XY. Selecting one of the tabs will move the currently selected plot to that tab. The check mark next to a tab indicates the plot presently pertains to that tab.

4.1.7 View

The View menu (Figure 4.9) is used to control the display of the various toolbars and information in Plot-XY. It is comprised of a checklist of items to either display or hide the various toolbars and other overlays in the Plot-XY window. The checks serve as toggle buttons; a check mark indicates that the item is being displayed, while an empty box indicates the item is hidden or inactive. If the Menubar is hidden, bring it back by right-clicking on the plot canvas, mouse over the View item to bring back the View menu check list.

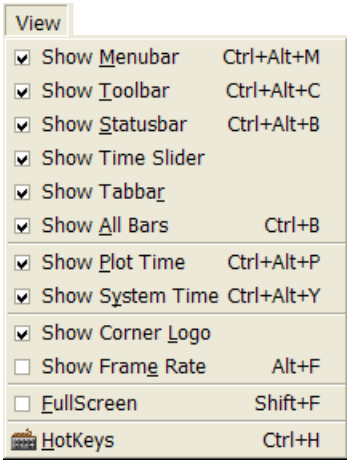


Figure 4.9: View Menu

Notice that checking and un-checking the Show Plot Time and Show System Time seem to have no effect when the Statusbar is hidden. Check the Show Statusbar item and notice that the Plot Time and System Time are displayed in the status toolbar.

Hot Keys

This menu item brings up the Hot Keys dialog, which allows users to assign keyboard keys to different actions and options. For more information on Hot Keys see Chapter 8.5.

4.1.8 Plug-in Tools

The Plug-in Tools menu (Figure 4.10) is where one can control Plot-XY plug-ins through the Plug-In Manager and open and run Plug-ins by selecting one from the list. The four plug-ins that, by default, come with Plot-XY are Simple Server, SuperPlot Loader, ASI Loader, and DCS Loader. The ASI Loader Plug-in has no user interface and is, therefore, not in the list under this menu.

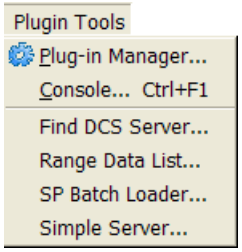


Figure 4.10: Plug-in Tools Menu

Plug-in Manager...
This menu item brings up the Plug-in Manager window, which shows all plug-ins currently loaded in the application, provides the functionality to start, stop, install, and uninstall plug-ins, as well as register plug-ins with the Plot-XY application. The Plug-in Manager is the preferred method to load plug-ins. For more information on the Plug-in Manager see Chapter 11.

Console...
This menu item opens a console window that reports any errors that Plot-XY encounters when dealing with the various plug-ins. The console will be fazed out in Plot-XY Version 9.0.

Items below the horizontal line
Items that appear below the horizontal line after **Console** are put there by a plug-in. The user's screen might look different depending on which plug-ins are loaded. Plug-ins might add one or more menu items to the menu, or might add none like the ASI Plug-in.

Simple Server...
This menu item opens a small window to connect to a live- or file-based simple server. Simple Server is a sample plug-in that comes with Plot-XY so new users can test basic functionality of the application. Connecting via simple server (actually simulating connect to a network or loading file data) will bring in several pieces of "dummy" data so plots can be created and data added to plots.

Find DCS Server...
This menu item opens the Locate DCS Server window, the interface to the DCS Server Plug-in. The window locates and connects to servers on a local area network.

SP Batch Loader...

This menu item opens the Graph Batch Loader window, an interface to the Super Plot Plug-in. SuperPlot is the name of the plotting program that SIMDIS used to distribute and for which Plot-XY is a replacement. The plug-in serves to support legacy formats the SuperPlot supported, namely, batch files through this interface.

Range Data List...

This menu item opens the Range Data Dialog. This dialog provides a textual list displaying range calculations between entities. Use the right click menu to interact with this dialog (Figure 4.11). With this dialog, the user has the ability to add/remove pairs, reset the

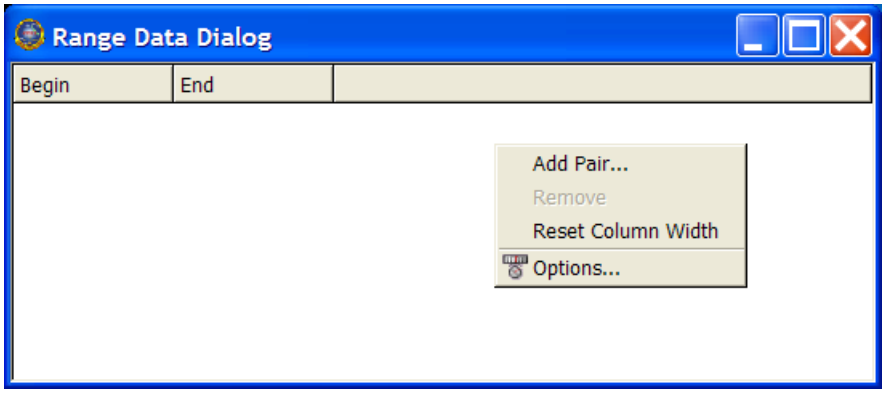


Figure 4.11: Range Data Dialog: Right-Click Menu

display column width, and configure range calculation options. Clicking **Add Pair...** from this menu brings up another dialog that allows users to add range calculation paris (Figure 4.12). Using the Add Range Pair dialog, select a begin and end enitity to use for a plot

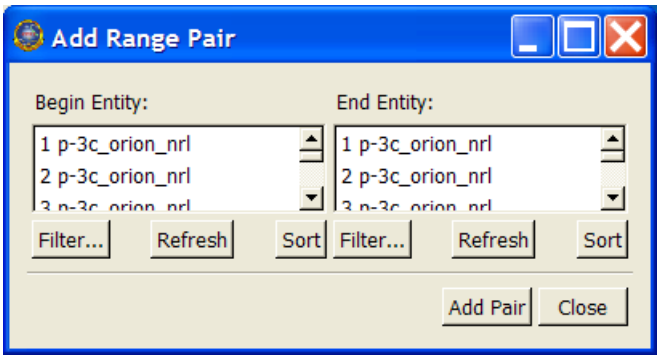


Figure 4.12: Range Data Dialog: Add Pair Window

pair and click the **Add Pair** button to add the pair into the Range Data dialog. To remove existing pairs, select the pair(s) and click **Remove** from the right-click menu. To configure options for calculations to be displayed, click **Options...** from the right-click menu. This action brings up the Range Options dialog (Figure 4.13). This tool allows users to customize

the Range Data dialog to display calculations of interest. This dialog also provides options for customizing the units and text display settings. To use this tool, select the category on the left, and make the appropriate changes on the right.

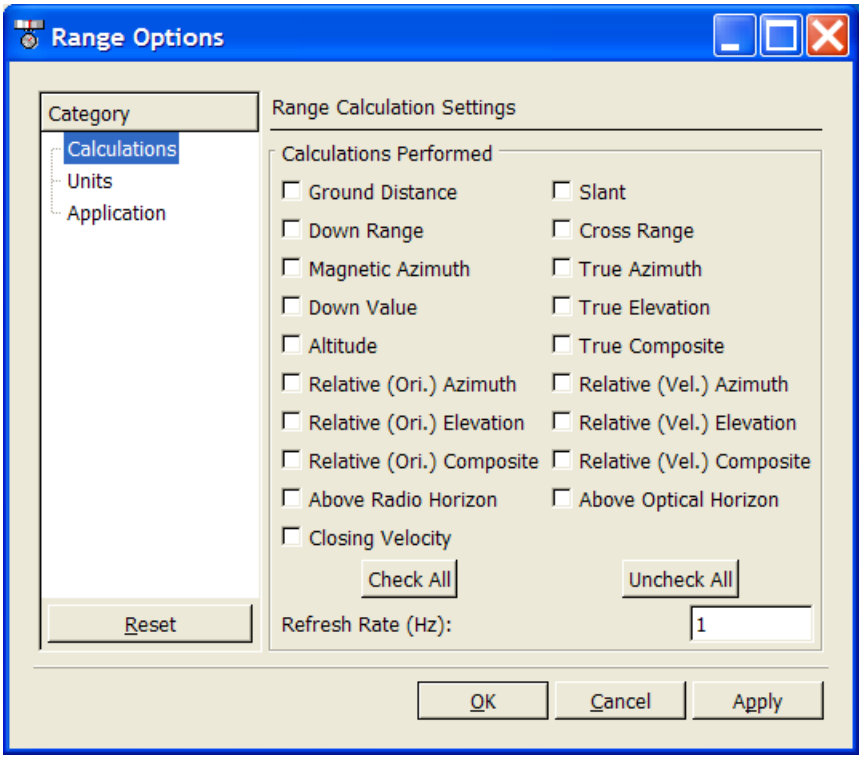


Figure 4.13: Range Data Dialog: Range Options Window

4.1.9 Help

The Help menu (Figure 4.14) is available to any questions about Plot-XY. Each item in the help menu brings up another window or dialog described below.

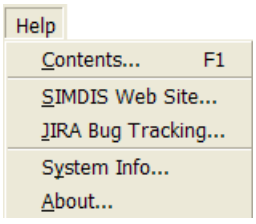


Figure 4.14: Help Menu

Contents...

Selecting the first item will open up a PDF version of this document.

SIMDIS Web Site...

This item will open the default browser and point it to the SIMDIS website (https://simdis.nrl.navy.mil).

JIRA Bug Tracking...

This item will open a browser and point it to the SIMDIS Help Desk & Issue Tracking web page (https://simdis.nrl.navy.mil/jira).

System Info...

This item opens a dialog (Figure 4.15) that can display a full summary of the current system.

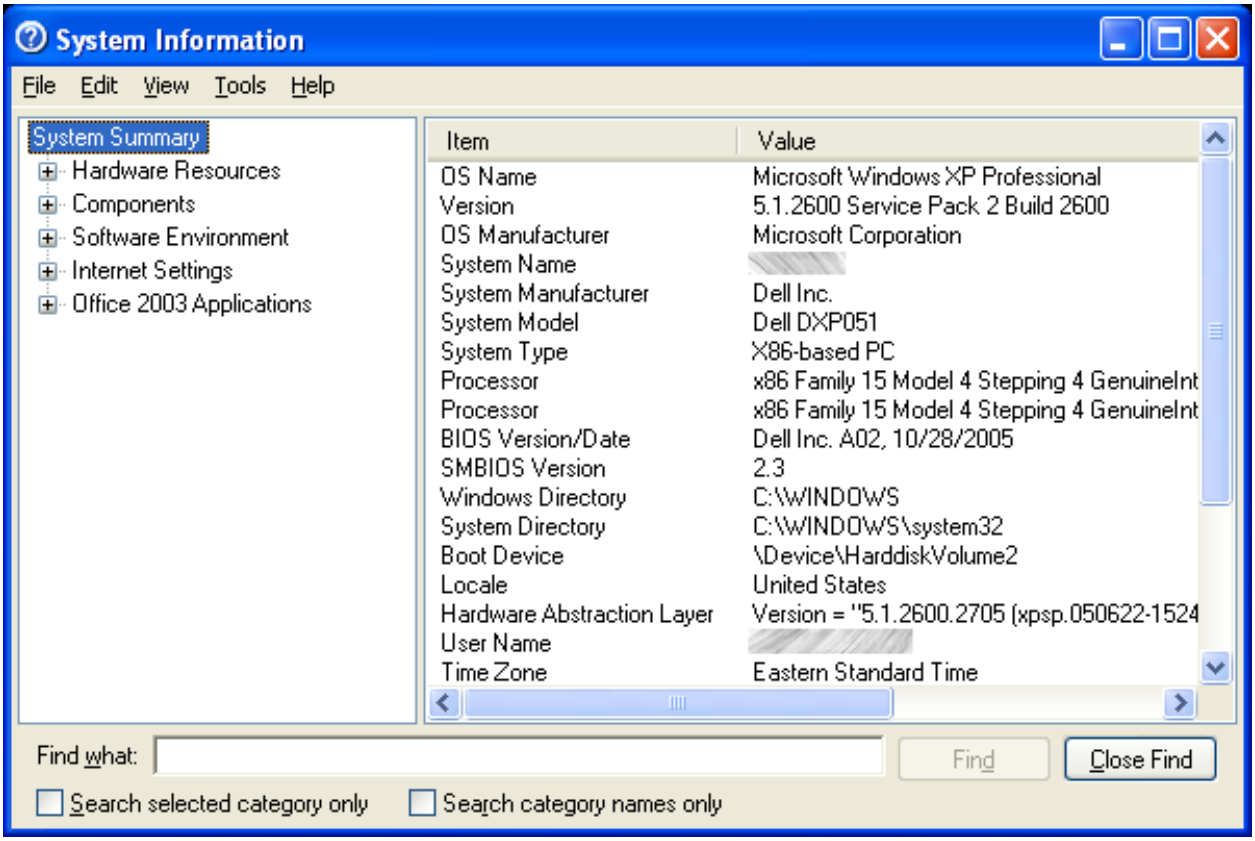


Figure 4.15: System Info Dialog

About...

Finally, the about item opens a dialog (Figure 4.16) that displays pertinent SIMDIS system information, such as, the executable directory, the Plot-XY version, the location of preferences file, etc.

4.2 Toolbar

The Plot-XY toolbar (Figure 4.17) is located just under the menu bar. It contains a row of icons that allow rapid access to commonly used functions. Each icon has a tool tip that briefly explains

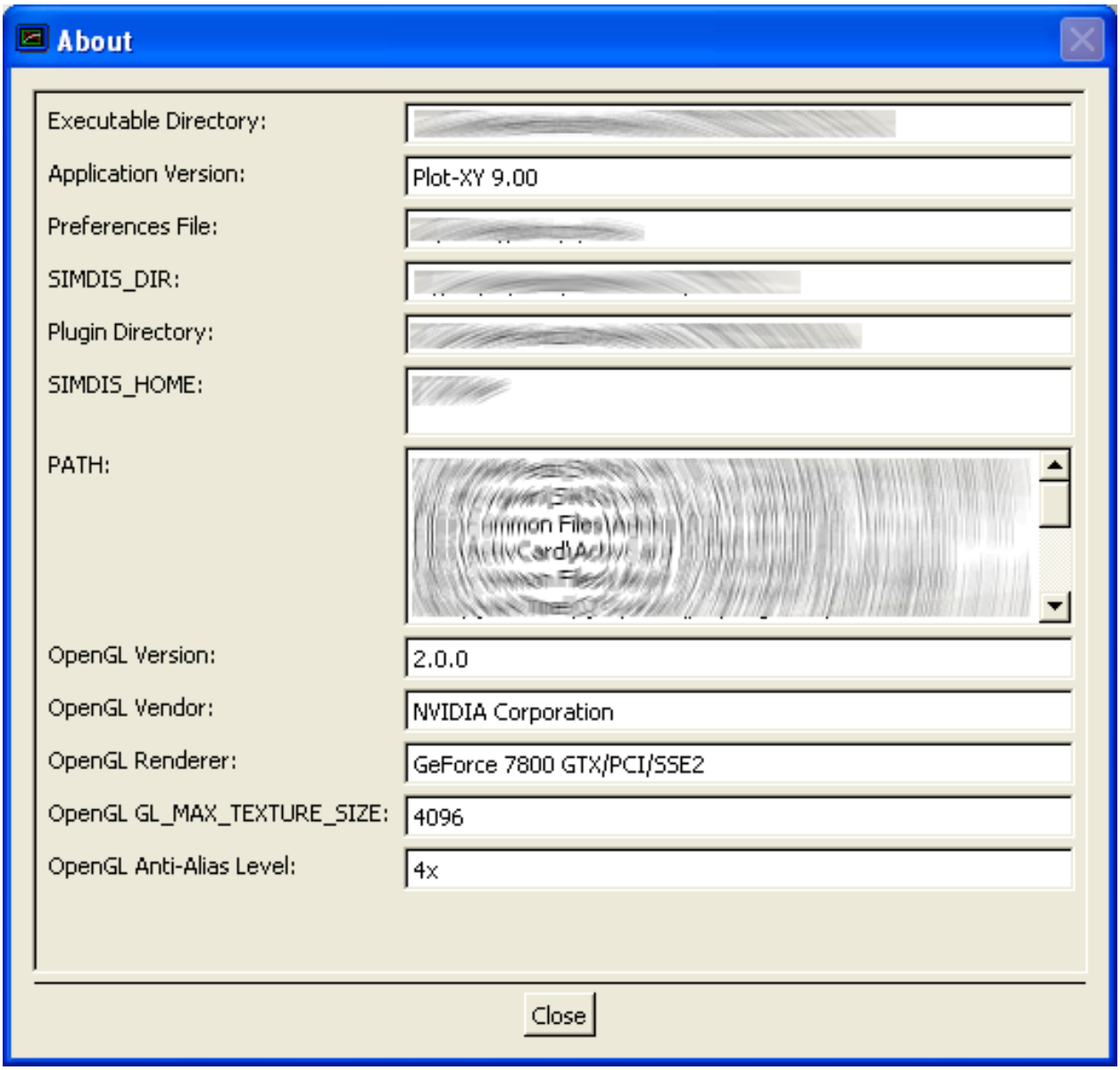


Figure 4.16: About Dialog

the icon's functionality by holding the mouse over it.

Figure 4.17: Toolbar

4.2.1 Open File

 The open file icon has the same functionality as the open file item under the file menu in the menu bar: it opens an existing data file into Plot-XY via the Load Data File dialog. Because data is mostly controlled by plug-ins, the File Filter option determines the types of files to open and which plug-in will open the data. The valid file formats are:

- SuperPlot Plot Files (`*.asp, *.bsp, *.binplot, *.plot`)
- SuperPlot Time Slice (`*.asg, *.bsg, *.graph, *.bingraph`)
- SuperPlot Time Slice Block (`*.bsb, *.binblock`)
- Excel CSV File (`*.csv`)
- ASCII Scenario Input File (`*.asi`)

4.2.2 Script Operations

Load Script

 Clicking the Load Script icon will open a window to load a configuration script into Plot-XY. For more information on scripting see Chapter 10.

Save to Script

 The Save to Script icon opens a dialog that to choose sections of the current Plot-XY session to save to a script. Clicking the **Save** button at the bottom of the dialog will bring up another window to specify the name and extension of the script to save.

4.2.3 Dialogs

Plot-XY has many dialogs that control how data is displayed. The three most frequently used dialogs are the Plot Manager, the Advanced Data Manager, and the Add Plot Pair window.

Plot Manager

 The Plot Manager configures many options of any of the plots currently in Plot-XY. For more information on the Plot Manager dialog see Chapter 7.

Advanced Data Manager

 The Advanced Data Manger controls how plot pairs are displayed in a graph. For more information on the Advanced Data Manager see Chapter 7.

Add Plot Pair

 The Add Plot Pair window adds data lines to a plot space. For more information on the Add Plot Pair dialog see Chapter 6.2.1.

4.2.4 Plot Operations

There are three common plot operations that are found in the Graph menu that affect the range of a plot and the drawing order of a plot. The operations are autofit, bring to front, and send to back.

Autofit

 Clicking the autofit icon will change the extents of the current selected plot so that all platforms in the plot are visible.

Bring to Front

 Clicking this icon will bring the currently selected plot to the front of the drawing canvas. In other words, the graph will appear "on top" of all other plots that it overlaps.

Send to Back

 Clicking this icon will send the currently selected plot to the back of the drawing canvas. In other words, the graph will appear behind all other plots that it overlaps.

4.2.5 Snapshot

 In Plot-XY it is possible to take a snapshot of the current display. Clicking the snapshot icon will open a window where one can save the snapshot. This functionality is also found in the File menu under Save Screenshot.

4.2.6 Time Server and Time Client

Time Server

Clicking on this icon will make Plot-XY become a Time Server. Plot-XY will then control the time of other time client applications, such as SIMDIS. See Chapter 8.3 of the SIMDIS User Manual for more information on Time Server and Time Client.

Time Client

This icon makes Plot-XY a time client. It will only affect the time of Plot-XY if another application is the time server (this application will have control over time, whereas Plot-XY will relinquish its control of time). Notice how the time controls (described below) become inactive when Plot-XY is a time client.

4.2.7 Time Controls

Like SIMDIS, Plot-XY has the ability to control the time of a scenario while in file mode. Time controls (Figure 4.18) are not accessible during network mode. Each of the icons in the time control section of the Toolbar is explained below from left to right.

Figure 4.18: Time Controls

Decreasing Time Step

 decreases the size of the time step, thus slowing down the rate of playback.

Step Back

 steps back one time step.

Play Backwards

 plays the scenario backwards.

Stop

 stops the time progression of the scenario.

Play Forward

 plays the scenario forward.

Step Forward

 steps forward one time step.

Increase Time Step

 increases the size of the time step, thus speeding up the rate of playback.

Real Time

 plays the scenario in real time. If Real Time is already selected, choosing this item will exit real time mode.

Time Editor

 displays the Time Editor dialog, which has all of the time control buttons along with input areas for the time and time step. The Time Editor provides the functionality to specify an exact time and time step. For more information on the Time Editor see Chapter 8.

4.3 Tab Bar

The Plot-XY Tab Bar (Figure 4.19) is located just below the tool bar. By default, an instance of Plot-XY has at least one tab called Main. If the the plot canvas becomes too crowded, new tabs can be created, which is essentially creating a new plot canvas. Tabs can be named and plots can be moved between tabs. Tabs can be reordered after creation by clicking on a tab and dragging it to a desired location. Clicking on a tab name in the Tab Bar will show that tab in the Plot Canvas.

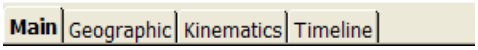


Figure 4.19: Tab Bar

The number keys, starting at 1, will also navigate through the tabs in the Tab Bar.

4.4 Status Bar

The Status Bar (Figure 4.20) is located at the very bottom of the Plot-XY window. It is divided into four sections: messages, locking, time, and mouse modes. Each section is described below in detail.

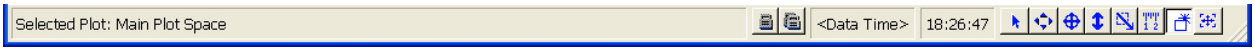


Figure 4.20: Status Bar

4.4.1 Status Messages

The left most part the Status Bar is an area where messages are displayed in Plot-XY (Figure 4.21). Most often the status message will identify which plot is selected. However, if when the mouse is placed over any button in the tool bar or status bar, the message becomes a tool tip for the button under the mouse.

Figure 4.21: Status Bar Message

4.4.2 Display Locking

Following the status message area are two buttons that serve to lock and unlock certain editing options. These options are typically turned on when the user should be restricted from making changes to the current plot canvas setup.

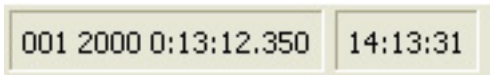
Editing Lock

 prevents any axis bound, translation, and resizing changes by the mouse. This lock is typically used in a setup where there should be no user interaction. When turned on, mouse modes for zooming, panning, resizing, and moving the plot will be disabled. However, adjusting these settings is still possible using the Plot Manager Dialog as discussed in Chapter 7.

Stacking Lock

 prevents any stacking order changes by the user. This lock is typically used in a setup where there should be no stacking order changes. When turned on, the user cannot change the stacking order of any plots through the mouse or Plot Manager.

4.4.3 Time Display



In between the locking buttons and the mouse mode buttons is the time display. If two times appear, the one on the left is the plot time and the one on the right is the system time. If there is only one time, a way to distinguish the two is that plot time is usually longer than system time. However, to accurately identify the time being displayed refer to the View menu in the Menubar.

4.4.4 Mouse Modes

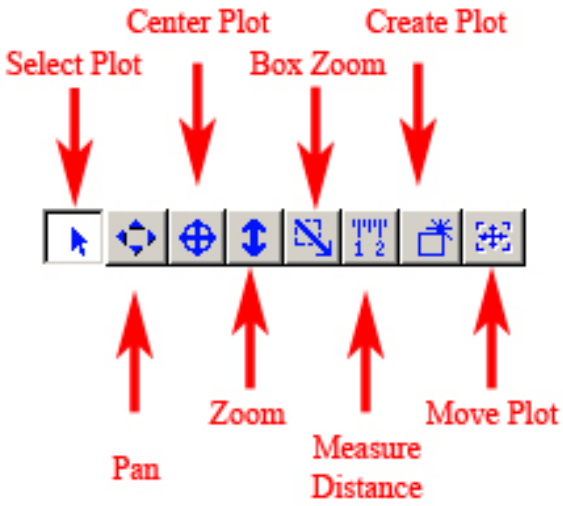


Figure 4.22: Mouse Modes

Plot-XY supports several different mouse modes, or instances where mouse functionality differs. Mouse modes are activated by selecting one of the toggle buttons in the appropriate section of the status bar (Figure 4.22). Only one mouse mode may be active at a time. The current mouse mode is indicated by a pressed button. The selected mouse mode will determine the function of the mouse **left-click** or **drag** as described below.

Select Plot

 selects the plot underneath the cursor. If multiple plots are underneath the cursor, a pop up will appear providing a choice between the plots. Certain actions, such as autofit, only apply to the currently selected plot space.

Pan

 pans through the selected plot by left-clicking and dragging the mouse. This is similar to Adobe Acrobat's hand-scroll motion.

Center Plot

 will center the plot on the location where the mouse is left-clicked.

Zoom

 will zoom in and out on the selected plot when left-clicking and dragging the mouse up or down.

Box Zoom

 will create an imaginary box in the selected plot when left-clicking and dragging the mouse. Releasing the left mouse button will zoom in so that the imaginary box represents the plot's extents. Single left-clicks in this mode will re-center the selected plot.

Measure Distance

works by left-clicking and dragging the mouse to temporarily draw a line from the click point to the current mouse location, showing the length of the line along each axis.

Create Plot

 will create a new plot space while left or right clicking and dragging the mouse. Dragging right indicates an increasing x axis, while dragging left indicates a decreasing x axis. Dragging up indicates an increasing y axis and dragging down indicates a decreasing y axis. Typical plots can be created by dragging from the bottom left to upper right, for increasing X- and Y-axes. A pop-up menu will prompt the user for the type of plot space to create. Whereas using the left mouse button will create a plot whose axes are the size of the box drawn, clicking and dragging the right mouse button will create a plot where the entire plot (including all text, labels, etc.) fits within the drawn box.

Move Plot

 selects a plot with a single left click. The currently selected plot will have a border around it, with eight control points: one on each corner, and one in the middle of each side. Dragging control points will change the width or height of the graph. This mode can be used to easily flip graphs from left-to-right, to right-to-left. Clicking and dragging anywhere within the graph that is not a control point will move the plot's location on the screen.

Chapter 5

Getting Data into Plot-XY

What are the different ways to get data into Plot-XY?

The purpose of Plot-XY is to display data in a two-dimensional format. In order to create and informative and visually pleasing display, Plot-XY needs data. There are two methods for importing data into Plot-XY: from a file and across a network. Although both methods are performed via plug-ins, Plot-XY handles the two types of data differently. This chapter discusses the differences between file- and network-based data and how to import data from the two sources.

5.1 Differences in File Data and Network Data

The main difference between using file data versus using network data is the mode in which Plot-XY operates. Opening a file places Plot-XY in file mode, while opening a network connection places Plot-XY in live mode.

Upon entering in file mode by opening a file, all data is loaded into Plot-XY at once. The data can be displayed at any particular time within the data's time bounds. Users can manipulate the time controls to alter the current time or the rate of playback. The application will interpolate data points to display smooth motion as time advances.

In contrast, live mode data enters Plot-XY as it is received from the network and has the possibility to be limited by the application. Data limiting is a configurable feature that helps prevent Plot-XY from using more memory than is available on the system. Time advances in real-time and, although, all known data history is displayed, the application time cannot be modified directly by the user. Instead time advances based on the system clock. Data points are displayed as they are received through the appropriate plug-in and data point interpolation is not performed. However, network data can be saved to a file and then viewed as file-based data.

Opening a file is usually less complex than opening a network connection. When a file is opened, the only necessary information is the name of the file to open and the plug-in that opens it. A

network connection might require several other options that are specific to the protocol being used. The following sections discuss in more detail how to open file and network data.

5.2 File-Based Data

File-based data is data that has been saved as an `.asi` file, a SuperPlot file format, or any file format that a plug-in has registered with Plot-XY.

As mentioned before, input to Plot-XY is driven entirely by plug-ins. To load file data, Plot-XY must have loaded a plug-in that has registered a file type with the application. The file types supported by Plot-XY may vary from one instance of the application to another, based on the plug-ins loaded at startup. Plot-XY is distributed with two plug-ins that can load file data: the ASI Loader and the SuperPlot Loader.

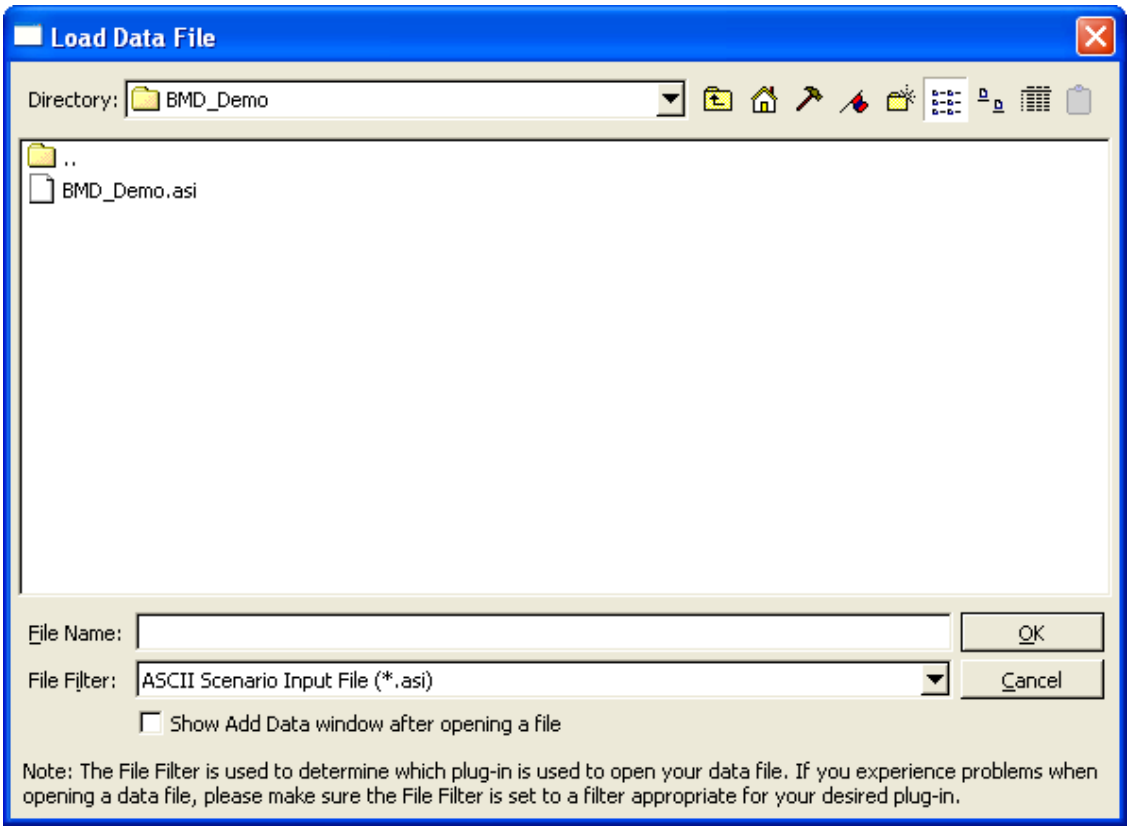


Figure 5.1: Opening a File

Files may be opened through the Open menu item in the File menu or the Open File icon in the Toolbar. The Filter Type menu is very important. When a file is selected, the selected filter determines which plug-in will handle the file. In Figure 5.1, the `BMD_Demo.asi` would be opened by the ASCII Scenario Input plug-in (ASI Loader).

After opening a file, the display will not automatically graph data. One must create plot spaces and add data to the plots, discussed further in Chapter 6. By default, the scenario's classification, as dictated by the plug-in, is displayed in the appropriately colored text on the Plot Canvas. Figure 5.2 is a typical display after opening a file. Notice the classification in green, the time scroll bar on the right-hand side of the Plot Canvas, the data time in the status bar, the active time controls in the toolbar, and several other enabled toolbar items. Once a file is opened, one can add data to plots (see Chapter 6.2 for adding data).

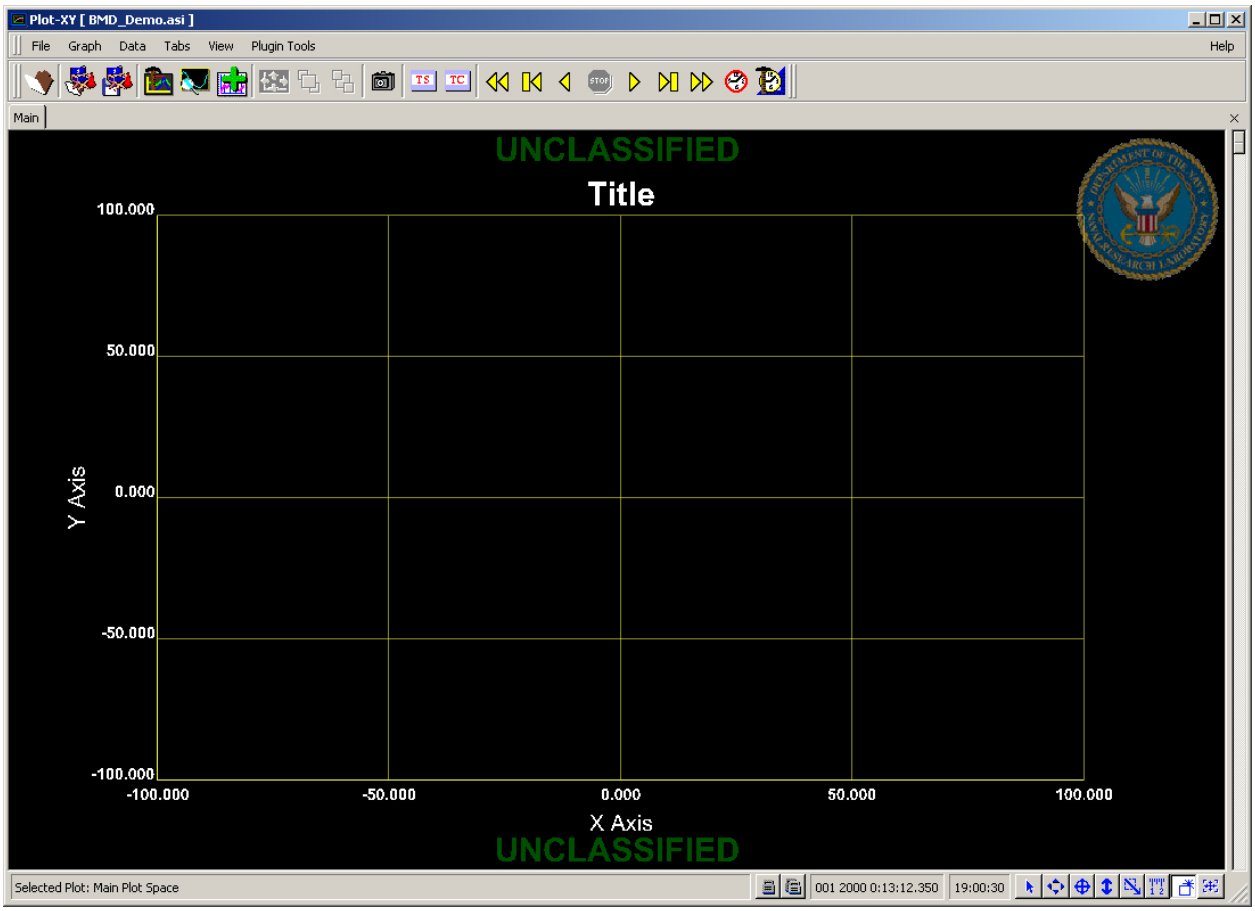


Figure 5.2: File Opened

To close the file select the **Close** item from the File menu. Plot-XY will be cleared of all the data from the file and appear as it does upon start-up.

5.3 Network-Based Data

Network-based data is data that is imported into Plot-XY through a live network connection or other mechanism where data streams into Plot-XY. The data is either entirely real-time or entirely simulated, but not a combination of the two.

Opening a network connection is often more complex than opening a file. Plot-XY must rely on the plug-in itself to gather necessary parameters for a network connection. Therefore, connecting to different live-data sources will have different user interfaces. Plot-XY is distributed with one plug-in that can read network data, the DCS Loader, and one plug-in that simulates network data, the Simple Server.

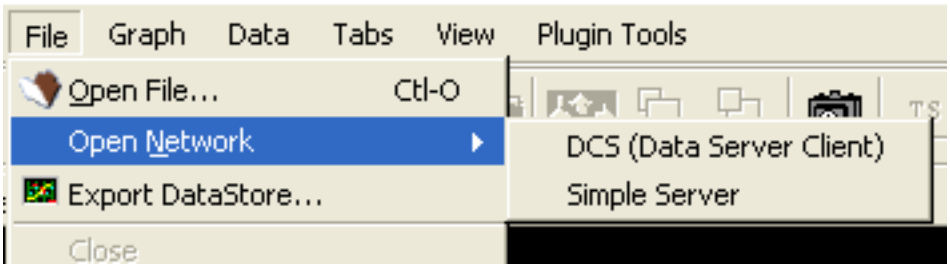


Figure 5.3: Opening a Network Connection

Plot-XY provides users with a convenient drop down menu from the File menu (Figure 5.3) to select the desired network protocol plug-in to use. Selecting an item in the Open Network menu will display a plug-in window that can be configured to initialize the data connection. Once connected, plot pairs can be added to plot spaces. Notice that time controls become disabled when connected to a network.

To stop importing live-data, select the **Disconnect** item from the File menu. The data feed will stop and Plot-XY will enter file mode. All the data that was received from the network connection can now be replayed and viewed in file mode.

Chapter 6

Plot Canvases and Plot Spaces

How do I create plot spaces and add data to plots?

The display area of the Plot-XY is called the **Plot Canvas** (Figure 6.1). The plot canvas is the black area where plot spaces are drawn. Plot spaces, what Plot-XY calls graphs, may contain various plot lines. However, often times one plot space displays all the data one wants to view. If one Plot Space will not suffice, Plot-XY supports the display of an unlimited number of independently configured plot spaces. As one can imagine a plot canvas may become over crowded. Using the tab functionality, one can have multiple plot canvases by creating new tabs. Tabs are a great way to organize plots so as not to over crowd a single plot canvas.

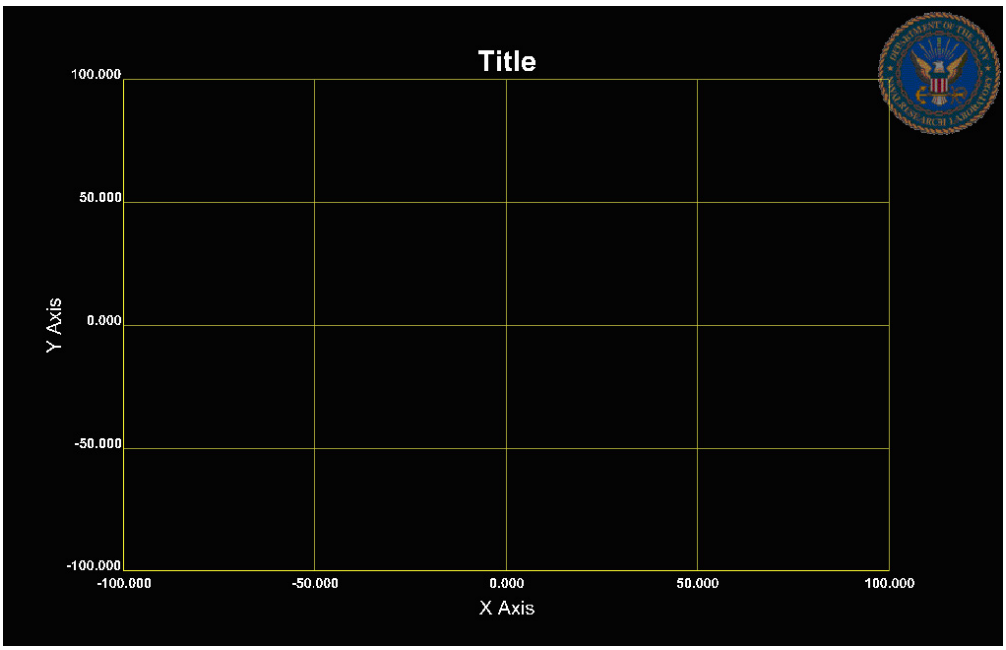


Figure 6.1: Plot Canvas

6.1 Creating Plot Spaces

In Plot-XY a graph is called a plot space. This is because the application can create more than just graphs as shown by the various types of plot spaces available discussed in Chapter 6.1.1. When Plot-XY is started, a scatter plot is displayed. To create a new plot, make sure the mouse is in Create Plot mouse mode,  , which is the default on start-up. Left-Click the mouse somewhere on the screen and then drag it to the desired size. Let go of the mouse and a menu will pop-up to select the desired type of plot (Figure 6.2). Another option is to select a plot type from the Create Plot menu item under the Graph menu. This will create a plot that is maximized on the Plot Canvas.

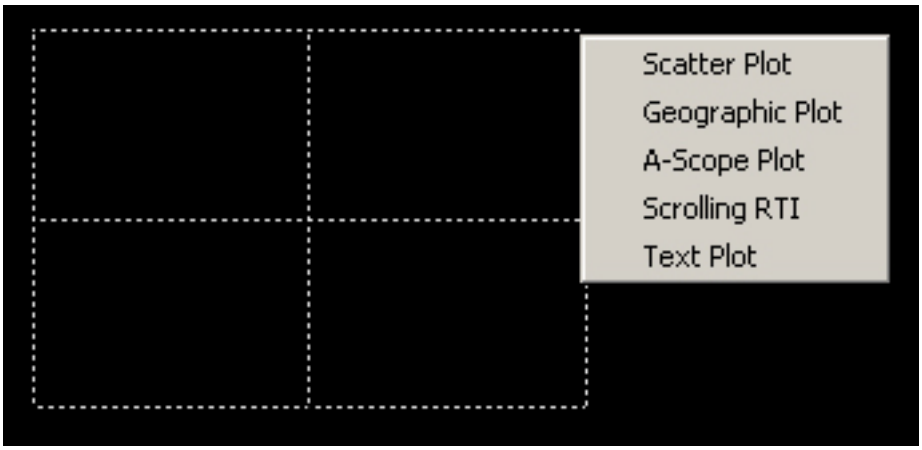


Figure 6.2: Plot Space Types

6.1.1 Plot Space Types

There are five different plot types in this application: Scatter Plot, Geographic Plot, A-Scope Plot, Scrolling RTI, and Text Plot. The selection of the plot type is largely dependent on the type of data. Different plots can show the same data in various ways.

Scatter Plot

A scatter plot is a traditional two axis graph that can plot any X versus any Y parameter (Figure 6.3). Possible parameters include time, a range calculation between two tracks, or any columnar data element associated with an object such as latitude or speed.

Scatter plots are the most powerful type of plot space in the application. Not only can one graph x vs. y data, but scatter plots can be used as strip charts, can scroll any data value, and can plot various units and multiple tracks at a time. Most data is displayed using a scatter plot.

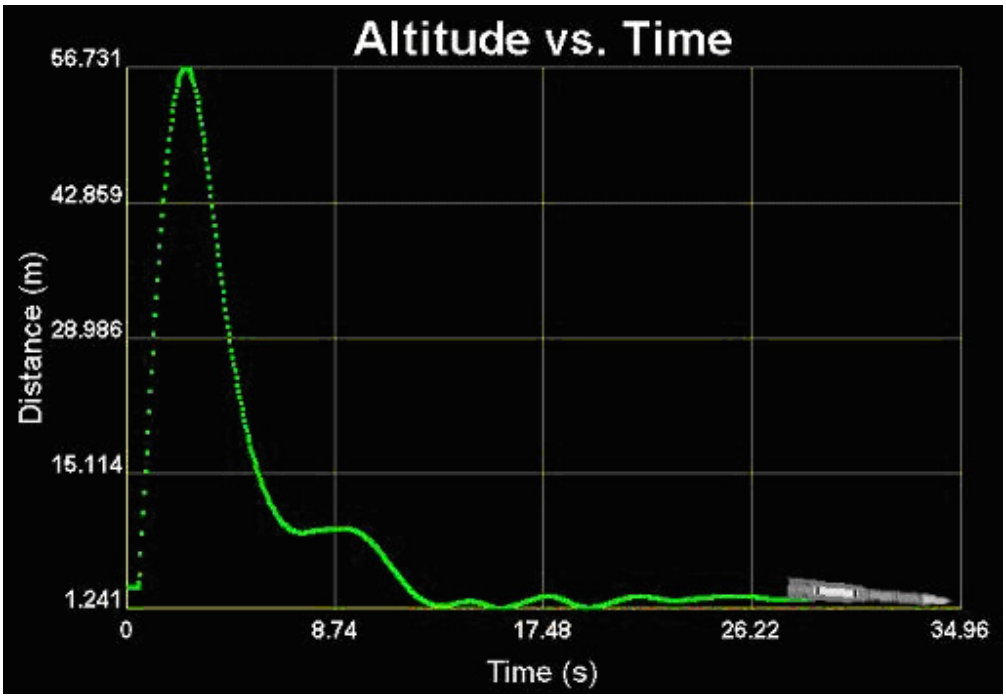


Figure 6.3: Scatter Plot

Geographic Plot

A geographic plot is a special type of scatter plot that displays the latitude and longitude location of every data track in a top-down-north fashion (Figure 6.4). As new tracks are entered into the scenario (either in live or file mode), the tracks are automatically added to a geographic plot. Essentially, a geographic plot is a top-down view of the current scenario and can be especially useful during live operations for situational awareness.

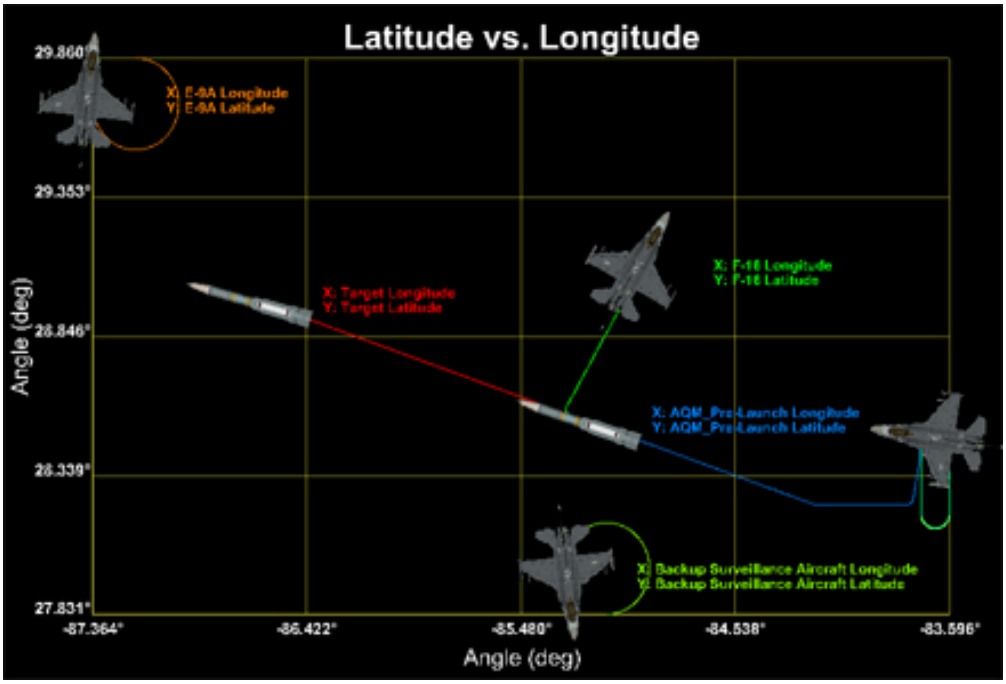


Figure 6.4: Geographic Plot

A-Scope Plot

An A-Scope Display is used to view array-based data such as radar returns (Figure 6.5). Although Plot-XY is typically used to plot one-dimensional columnar data versus time, such as latitude or speed, it can also be used to plot two-dimensional array data such as radar returns (voltage over range over time). The data for an A-Scope plot is represented by time slices. Each time slice is its own graph and is, therefore, represented as sequential X and Y pairs. A-Scope plots will draw the time slice for the current time, along with any range gate data that is supplied through the plug-in. Thus, instead of data line adding points over time, an A-scope plot completely changes as time progresses because each time slice produces an entirely new plot display. A-Scope plots are most often used to plot radar voltage return values over distance.

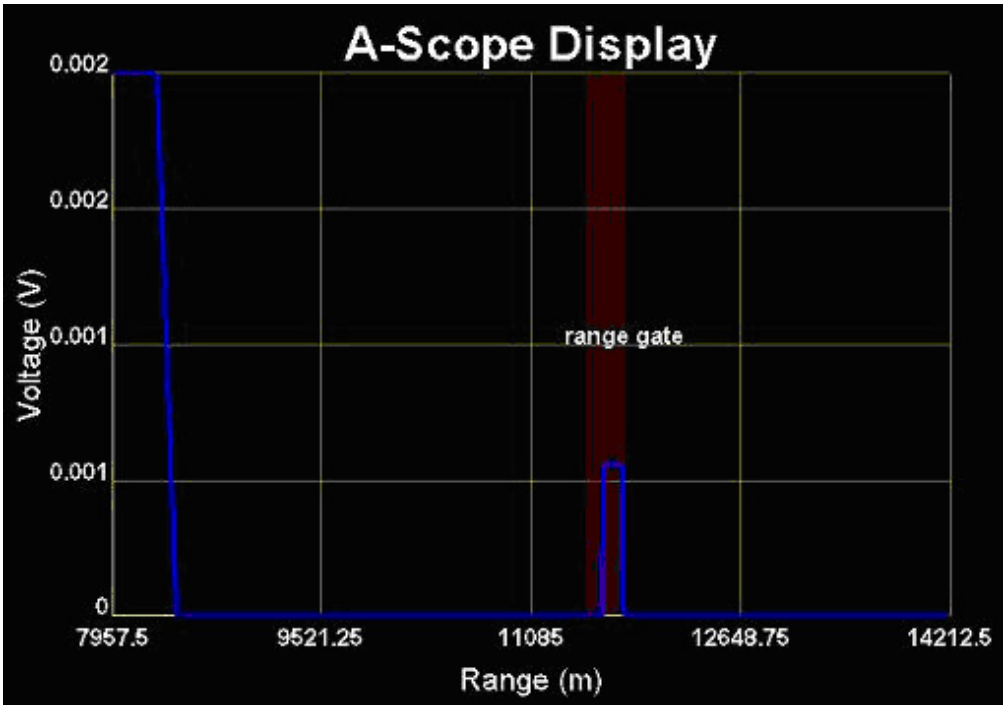


Figure 6.5: A-Scope Display

Scrolling RTI

A Range Time Intensity (RTI) Plot displays the time history of an A-scope plot using a color gradient to represent signal intensity (Figure 6.6). Thus an A-Scope plot is like a snapshot of an RTI display and an RTI display is the history of all A-Scope progressions over time.

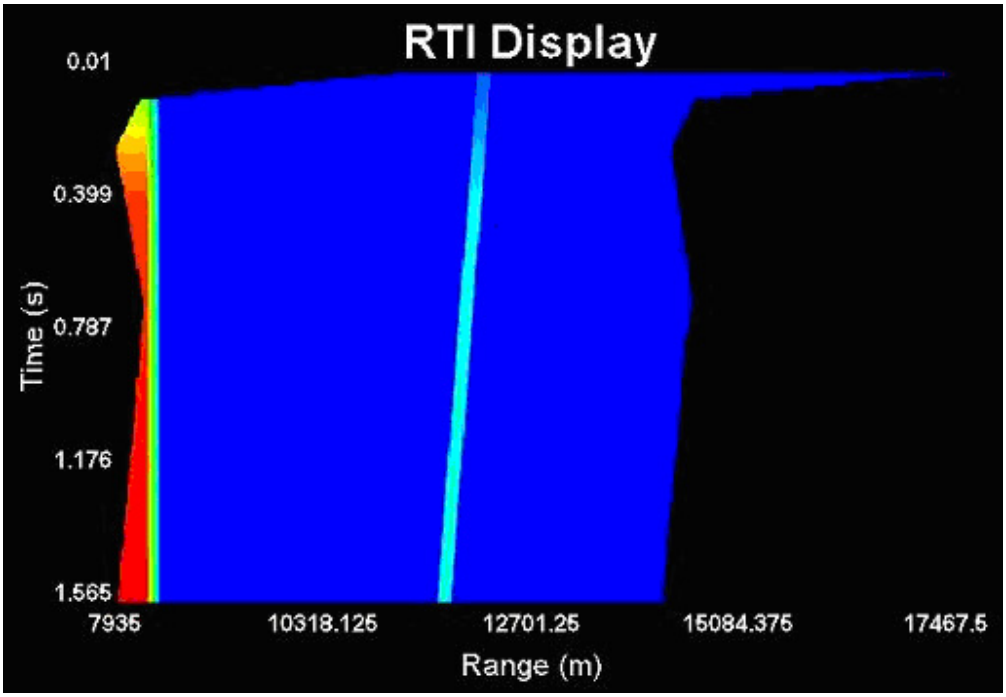


Figure 6.6: Scrolling RTI Display

Text Plot

A Text Plot is used to display data in a text format (Figure 6.7). Each piece of information that is displayed on a text plot is one of the parameters of an entity, such as latitude, X velocity, or the range between two entities. Data that is added to the plot is automatically assigned a name that describes the information. There is no limit on the amount of data that can be displayed. The order in which data is presented can be modified by use of the Text Plot tab in the Plot Manager.

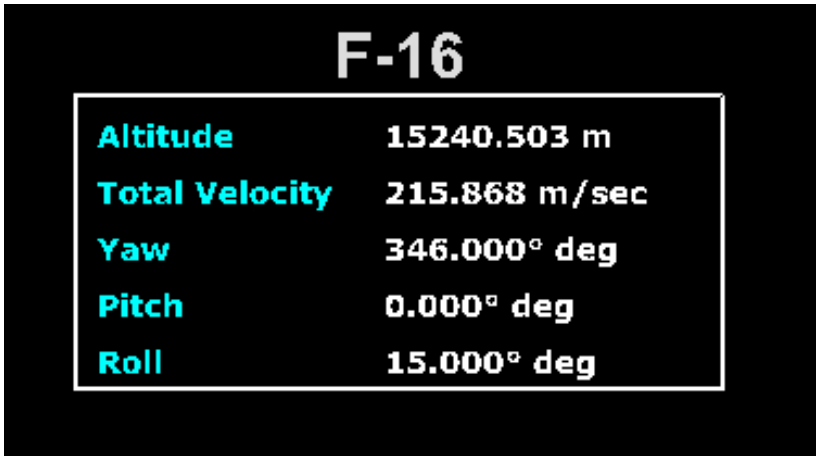


Figure 6.7: Text Plot

6.1.2 Drawing Order

The ability to draw multiple plots introduces the problem of layering. The plot canvas is similar to a desktop workspace, with papers (the plot spaces) placed on top of one another. A paper placed over top another paper will partially obscure the paper underneath. The same is true with plot spaces on the plot canvas. The plot spaces drawn first will be obscured by opaque or semi-transparent plot spaces that are drawn later. The idea of a plot being drawn before another is referred to as the drawing order. At first, the drawing order is determined by the order in which plots are created. However, it is possible to change the drawing order of plots. In Figure 6.8, the larger red plot is drawn first and the smaller black plot is drawn later and on top of the larger red plot. Whenever a plot a selected, that plot is automatically brought to the front. Clicking on the red plot in Figure 6.8 with the stacking lock off will draw over the smaller black plot, hiding it in the back.

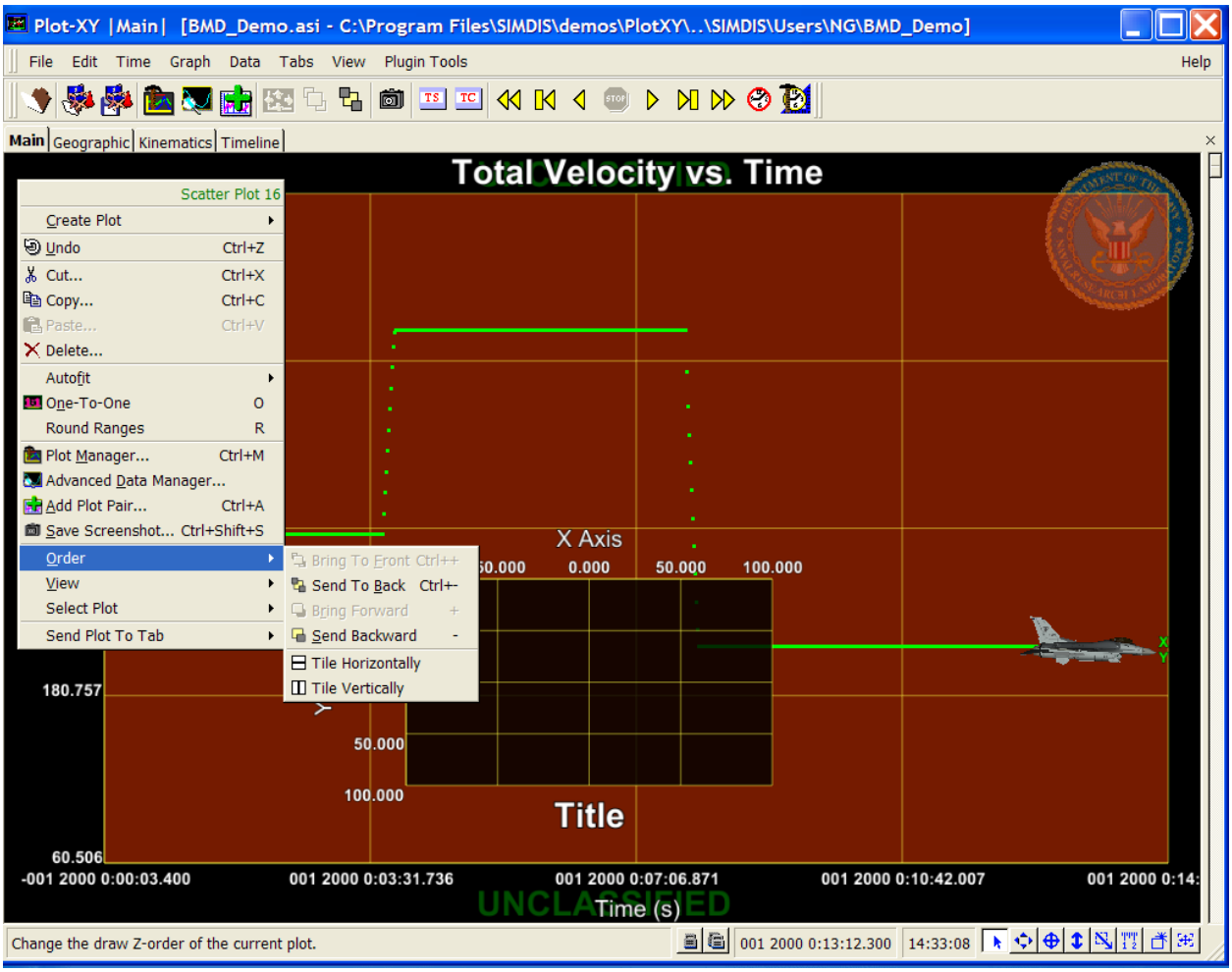


Figure 6.8: Drawing Order

There are three ways to change the drawing order of the plots in the plot canvas. Starting with the fastest method, the toolbar has icons that will Send to Back or Bring to Front the currently selected plot. One can also select Bring forward or Send backward in the Edit menu under the Order submenu. Finally, the most powerful control of the drawing order is found in the Plot Manager. The list of the plots on the left hand side of the dialog indicates the complete drawing order of plots from top to bottom. The plot on the top of the list is drawn first. Note that the drawing order lock must disabled.

6.1.3 Current Plot Selection

Another problem that arises with multiple plot spaces, is the delegation of mouse-based operations. For example, during pan operations, only one plot should pan while the user moves the mouse.

To solve this problem, Plot-XY maintains a current "selected plot." The selected plot is always displayed in the status bar. The Pan, Re-center, Zoom, and Box Zoom mouse modes will only work on the selected plot, regardless of where the mouse is initially clicked. The Move Plot mouse mode will select new plot spaces as they are moved or resized. The Create Plot Space mouse mode will select the newly created plot space automatically.

6.2 Adding Data to Plots

Once scenario data (either file- or network-based) is loaded into Plot-XY, the application is ready to plot data. Data is added to existing plot spaces by using the Add Plot Pair window (see Figure 6.9). To bring up this window use the icon on the Toolbar or select the Add Data item under the Data menu. Graph lines are referred to as "plot pairs" to indicate that the data for the graph line comes from a pairing of two distinct data columns.

6.2.1 Add Plot Pair Window

As Figure 6.9 shows, the powerful Add Plot Pair window is divided into several sections. The top 75% of the window is used to configure a new or existing plot pair and the bottom quarter displays the plot pairs drawn in a given plot space. The plot pair configuration section will be different for each Plot Type. Figure 6.9 shows the add plot pair configuration for a Scatter Plot.

The top part of the window is divided in two sections, one on the left and one on the right. The left half cooresponds to the x axis while the right half cooresponds to the y axis.

Plot-XY can graph three different types of data: time, object parameters, and calculated values. The first step before adding data is to identify which of the data source types belongs on which axis. The Data Source Types radio buttons are set to indicate the source to use. The simplest

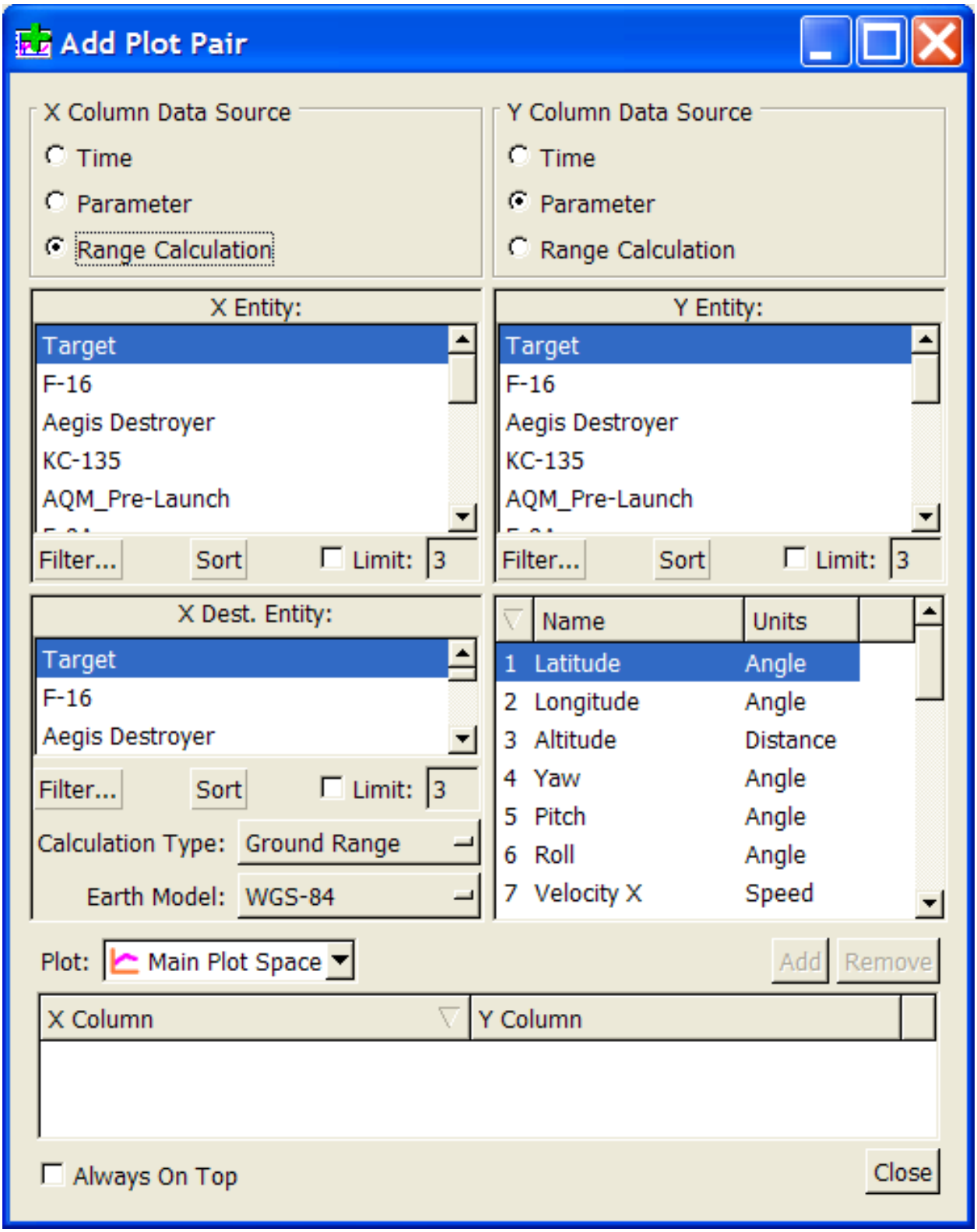


Figure 6.9: Add Plot Pair Window

plots graph a parameter on the y axis against time on the x axis, which is the initial default setting upon opening the dialog.

The entity list below the three radio buttons lists all objects in the scenario. The entity list appears in several other Plot-XY windows, all of which have the same functionality: to display a list of all entities in Plot-XY. The list can be sorted by name and names can be limited by a given number of characters for ease of reading. In addition, each entity list can be filtered uniquely by "category data" supplied by the data plug-in. Check boxes indicate that items are visible, while unchecked items are not visible. Additionally, users may filter items based on regular expressions through the filter window. When time is selected as the data source type, the entity list and entity parameters list are disabled.

When a parameter is selected, the parameter list is populated with possible data columns directly found in the data. These parameters include position, orientation, velocity, and derived values. Tangent plane parameters, such as X, Y, and Z Ortho, are derived based on the application reference point defined in the options dialog.

The third data source type is a **range calculation**. The range calculation class of data uses information about two separate entities to calculate a value based on their TSPI data over time. These calculations include range (ground, slant, down, cross), angle (azimuth, elevation, composite), and other delta (altitude, velocity) calculations. Many calculations can be performed using a WGS-84 ellipsoidal earth or a tangent plane flat earth model.

After the X and Y columns have been set, click the **Add** button to add the data to the plot space selected in the Plot list. Selecting a different plot from the plot list allows users to add plot pairs to any plot space. In addition, selecting a plot from the list changes the application's "selected" plot space, as displayed in the status bar and right click menu.

It should be noted that Plot-XY does "smart" unit conversions. The application can change units from feet to meters to millimeters, among other units and unit types, through single-click operations. Although Plot-XY can plot any X-value and unit against any Y-value and unit, as well as plot several lines on a single graph, the application does not strongly support mixing and matching unit types. For example, a single plot space can easily plot latitude versus time and longitude versus time, because each plot pair is an angle versus a time value. However, the same graph cannot graph altitude versus time and correctly scale values because there is no direct relationship between angles and distance units. The application warns the user when incompatible plot pairs are mixed on a single plot space.

The bottom of the dialog includes a list of plot pairs. Selecting a plot pair will set the values of the upper section of the dialog to whatever the plot pair represents. Plot pairs can be removed

from plot spaces via this dialog as well with the **Remove** button.

Adding or removing a plot pair has an immediate impact on the graphical display. Labels are reassigned based on the data types added and default units are applied to previously axes without units. Plot pairs are initialized with default settings as dictated through the preferences and options dialog settings. Typically, a new icon will be visible on the plot space that represents the new plot pair. The graphical icon is assigned automatically based on the types of entities and parameters. A plot of a ship's latitude and longitude values would draw an overhead ship icon, while an altitude versus time plot of a helicopter would show a side-view icon of a helicopter. Icons are drawn semi-transparent on the edge of the plot space if the most recent data point is off the current view. By default, adding a plot pair also autofits the graph. To prevent this action from happening, default options can be changed via the options dialog (Section 8.6).

Multiple plot pairs can be added to a single plot at once. To do this, hold **shift** and/or **ctrl** to select all the x and y entities you would like to plot. For example, imagine a scenario with entities missile, airplane, and helicopter. To create a velocitiy versus time plot of all three entities, select time for the x axis and multi-select all the entities in the y entity list. Lastly, select velocity as the y column parameter and click add. To create a text plot displaying velocity and altitude for the missile, select missile for the entity, and then multi-select velocity and altitude. To create a scatter plot of ground range versus altitude of missile range versus missile altitude, airplane range versus airplane altitude, and helicopter range versus helicopter altitude, select all three entitiies for both x and y columns. Setup the range calculation for the x axis and select altitude for the y axis. Upon clicking add, Plot-XY detects that matching x and y entity names and queries the user on what action to take next (Figure 6.10). In this case, only matching entity names is desired, so the user must click **Yes**. However, if plot pairs with differing x and y entities (i.e. missile range versus airplane altitude and missile range versus helicopter altitude) are desired, the user should click **No** when that dialog appears.

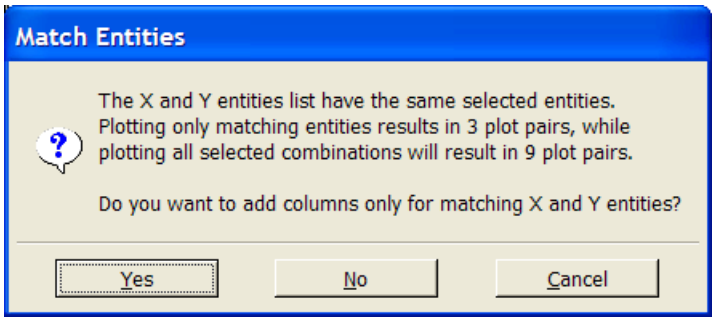


Figure 6.10: Match Entities dialog that appears while adding multiple items to a plot at once

Plot-XY supports other plot types besides scatter plots as discussed earlier. Each plot type uses this same Add Plot Pair window. The Add Plot Pair window looks slightly different depending

on the type of plot that is selected in the Plot Space Configuration section at the bottom of the window.

6.2.2 Data Discovery Rules

These rules are used to automatically add plot pairs to plot spaces as new tracks are detected in Plot-XY. For example, geographic plots can be considered scatter plots containig a rule that automatically adds all tracks with a latitude and longitude data column. To access this dialog, click on **Discovery Rules...** from the Data menu (Figure 6.11).

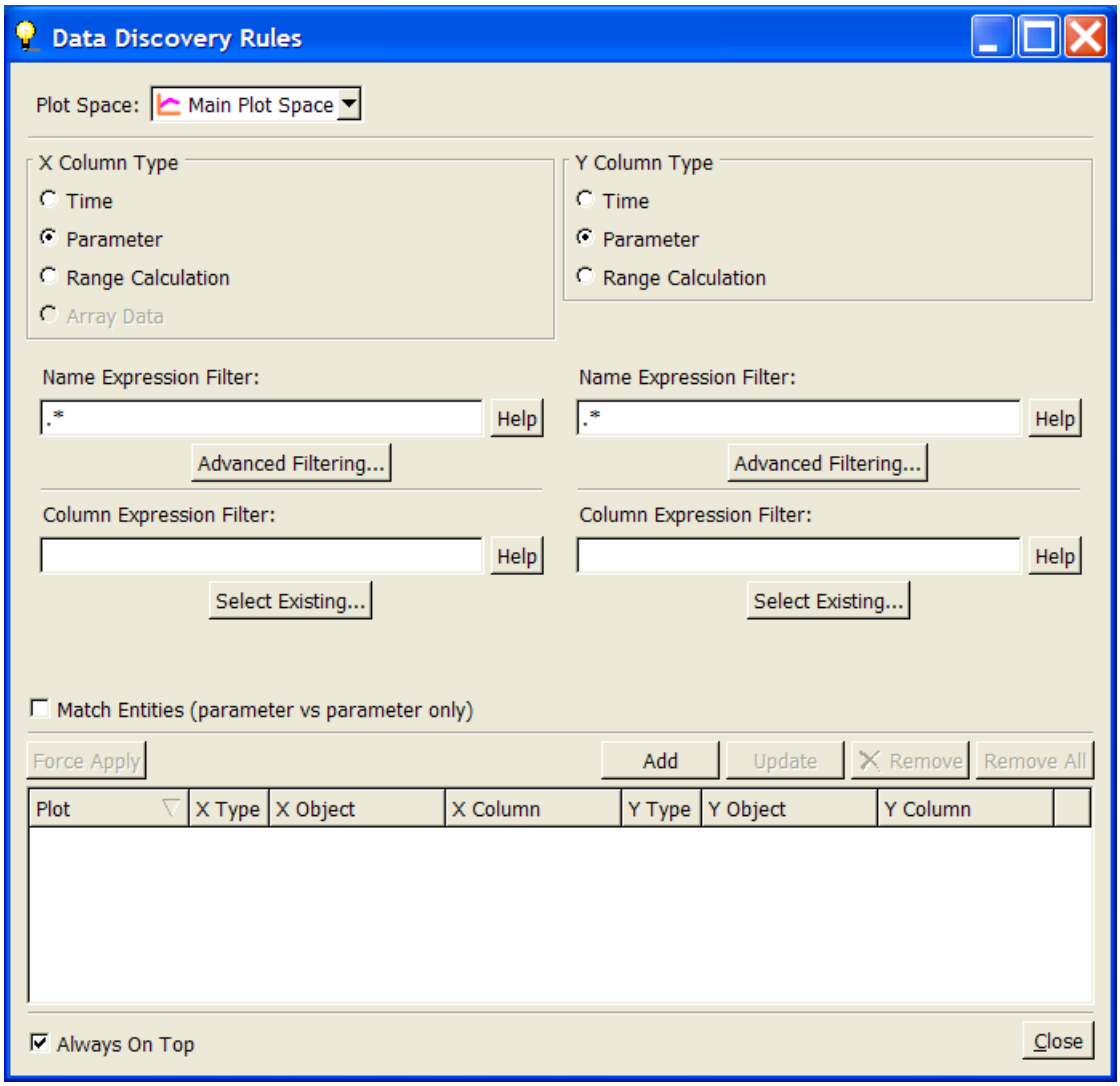


Figure 6.11: Discovery Rules Dialog

This dialog is similar to the Add Plot Pair dialog in that its left and right halves correspond to the x axis and y axis respectively. At the top of the dialog is a combo box that allows users to select the plot in which the rule applies. Next, the user must specify the type of data, entity name,

and data column to plot. The radio buttons are used to specify data type. The "Name Expression Filter" and the "Column Expression Filter" are used to specify which entities and columns to plot. The regular expressions are matched against incoming data and if there is both an entity name and column name match for both axes, the track is automatically added to the plot. The **Advanced Filtering...** option allows users to not only filter based on names of the entities, but also by category type (Figure 6.12). These category type filters allow all entities in the checked categories

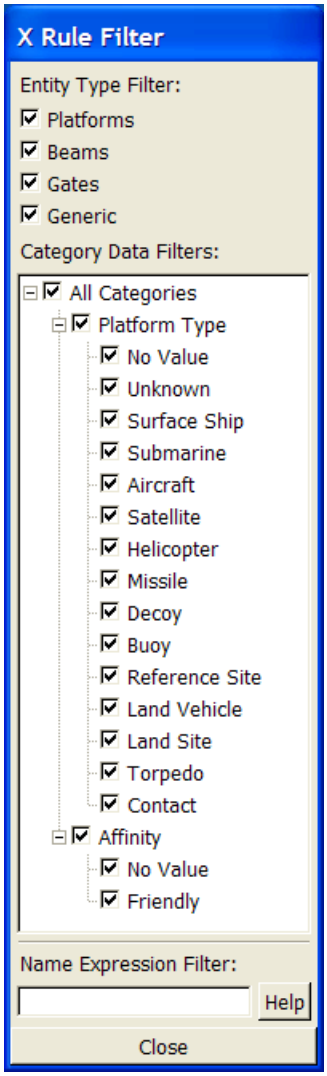


Figure 6.12: Discovery Rules: Filter Dialog

to pass and be automatically added to the plot. The **Select Existing...** option lists all columns that have already been deteced in Plot-XY (Figure 6.13). Selecting an existing column will replace the "Column Expression Filter" with the expression that only allows the selected column to pass through.

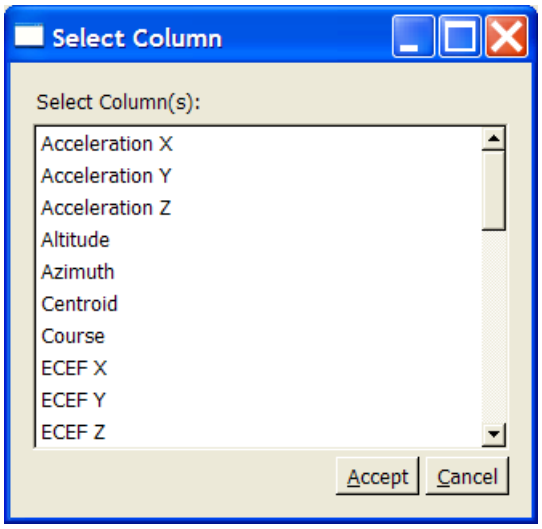


Figure 6.13: Discovery Rules: Column Selection Dialog

Once the rule is setup, clicking the **Add** button will add the rule into the list box at the bottom. **Force Apply** can be used on selected rules if the data already existing in Plot-XY should be retroactively added to the plot.

6.2.3 Autofit

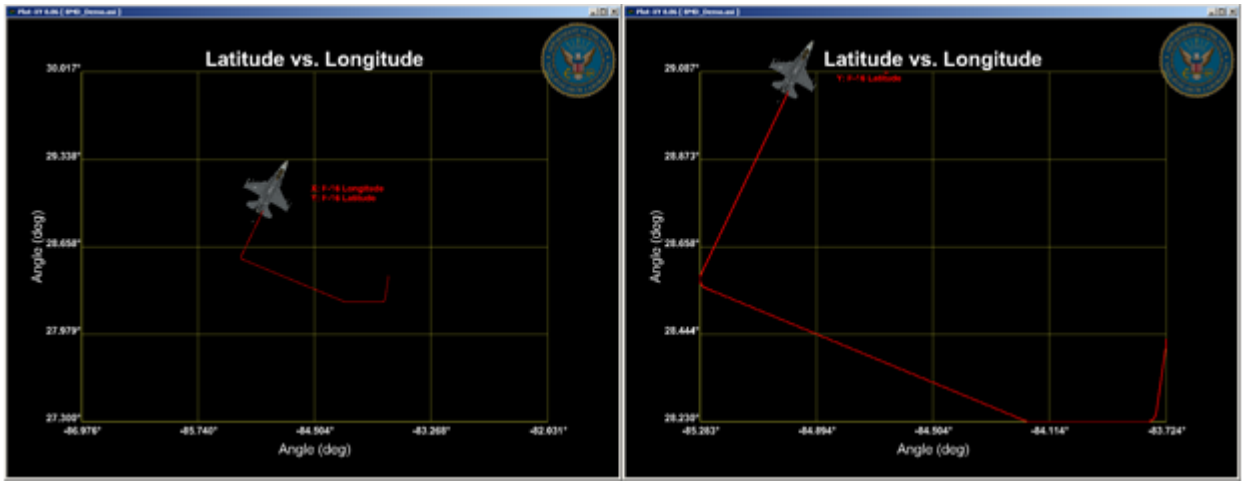


Figure 6.14: Autofit - Before and After

Autofit is a very important and useful feature in Plot-XY (Figure 6.14). After adding data, the plot bounds of the plot space do not always change. Typically, the new plot line might be off the edge of the graph. Autofit will resize the plot bounds to include every data point in the visible window. Autofit is an action that occurs only once, when the user clicks the button. It will not continue to change graph bounds as new data points are added, unless the user clicks the button a second time.

Autofit can be activated through the toolbar, through the Graph menu, through the right-click context menu on the plot space, through the Advanced Data window, and through the `f` key.

6.2.4 One-to-One

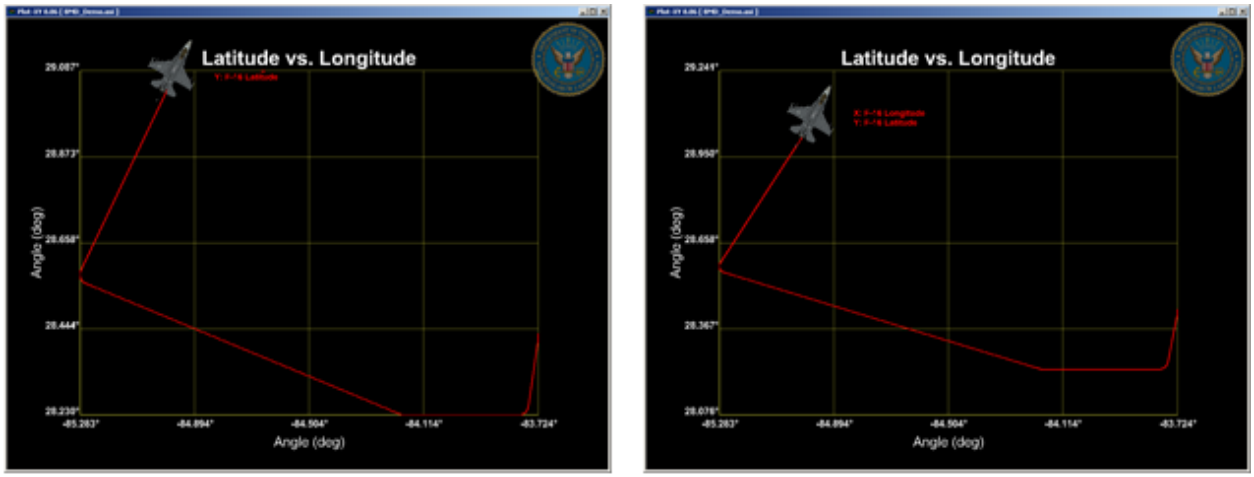


Figure 6.15: One-to-One - Before and After

Another important feature is the one-to-one function. While the autofit feature will change the graph bounds based on the current data, it will not scale the X- and Y-axes evenly. As a result one axis or another might be stretched dramatically. In many circumstances this is not a problem, as the X and Y unit types are unrelated and labels give a reference to the data values. However, equal perspective between axes that represent the same unit data is important. Overhead latitude versus longitude plots are one example. The One-to-One function can be accessed through the Graph menu, right-click menu, or plot manager. See Figure 6.15 for a before and after example of performing this action on a plot.

The One-to-One function will typically extend the bounds of the more compressed axis so that the distance between pixels on the x axis is equal to the distance between pixels on the y axis with reference to the unit types. However, if the **Always one-to-one** option is turned on, there are three cases to consider: no axes scrolling, one axes scrolling, and both axes scrolling. Consider a plot space that has been set to always be one-to-one. If a box zoom was performed, thus offsetting the scale, and no axes or both axes are set to scroll, the more compressed axis is expanded to achieve one-to-one. Otherwise, if one axis is scrolling, the non-scrolling axis will be the one to adjust.

6.2.5 Round Ranges

Often for display purposes, it is desirable to have human-readable values represented on the X- and Y-axes labels. The Round Ranges function will expand the graph area in an attempt to

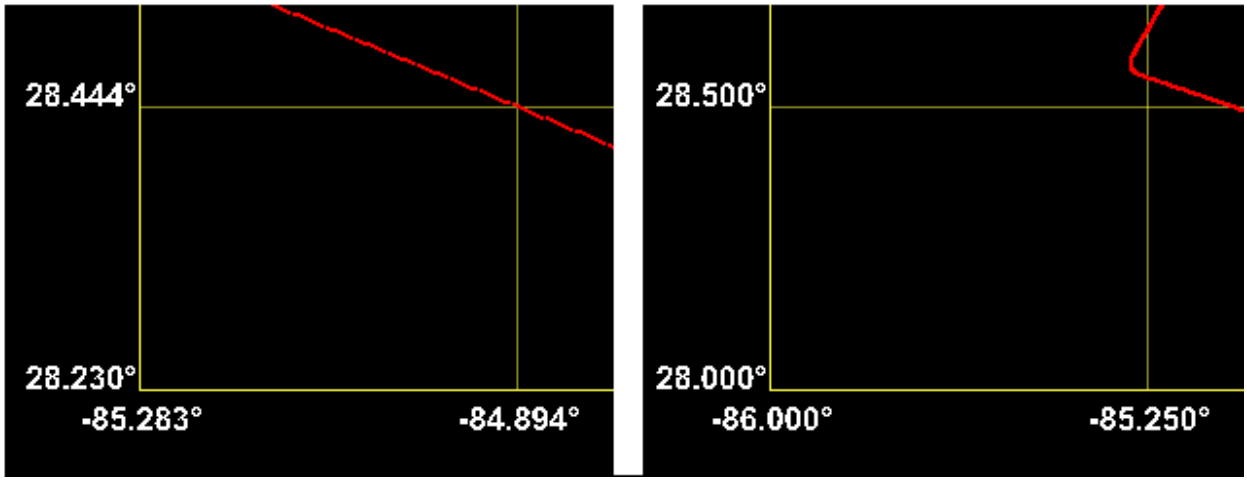


Figure 6.16: Round Ranges - Before and After

maintain the current display and replace the extents with a "smooth" gradient of numbers. This feature can be accessed through the Graph menu or the right-click menu (Figure 6.16).

6.3 Plot Space Right-Click Menu

In addition to the normal menu bar, Plot-XY provides a right-click context menu when the mouse is right-clicked on the Plot canvas (Figure 6.17). This menu provides several shortcuts to commonly used menu items. Users can access the plot manager, add data, and advanced data windows, as well as delete plot spaces and use the plot functions such as autofit and one-to-one, and several other options.

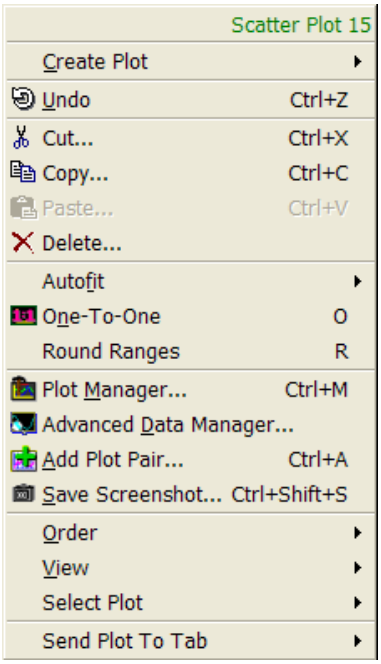


Figure 6.17: Plot Space Right-Click Menu

Chapter 7

Plot Manager and Advanced Data Manager

What can I do with the Plot Manager and the Advanced Data Manager?

Two of Plot-XY's most powerful and frequently used dialogs are the Plot Manager and the Advanced Data Manager. While the former controls the appearance and location of plot spaces, the later interfaces to the control of the appearance of data lines, or plot pairs, within plot spaces. Both dialogs are discussed in full detail in this chapter.

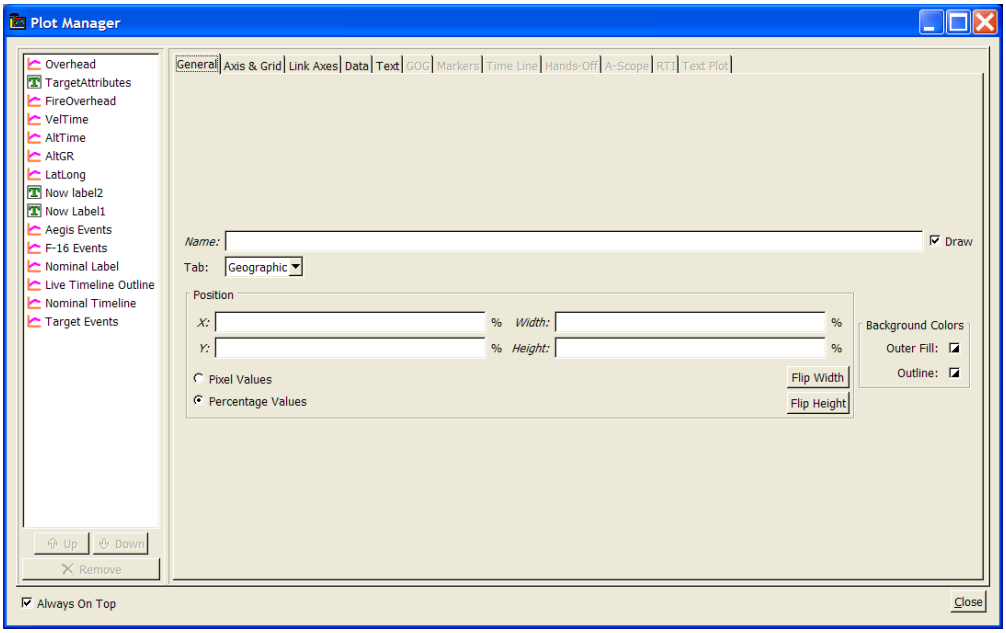


Figure 7.1: Plot Manager Overview

7.1 Plot Manager

The Plot Manager window (Figure 7.1) is used to manipulate various configuration parameters for existing plot spaces. The window is designed as an administrative center for controlling the operation of Plot-XY. Several tasks can be performed with the Plot Manager. The left side of the window, outlined in orange, allows users to remove entire plot spaces and change the plot drawing order when multiple plots exist. In this window, icons are paired with plot space names to differentiate the types of plots. Those icons are:

 Scatter Plot

 Geographic Plot

 A-Scope Plot

 Scrolling RTI

 Text Plot

The right side of the window, outlined in blue, allows access to specific tabs to perform more detailed tasks. Relative and absolute GOG files can be added and attached to data through the window. Various parameters for plot text can be changed, as well as colors and positions of plot spaces. The Plot Manager also includes settings for hands-off scrolling.

7.1.1 Accessing Plot Manager

There are several ways to open the Plot Manager window. Through the menu bar, under the Graph menu, Plot Manager is the third item. The fourth icon in the Toolbar will also display the Plot Manager. Plot Manager is the fifth item in the Right-Click menu; and finally the hot-key `Ctrl+M` (control key and M key) will also open the Plot Manager window.

7.1.2 General Tab - Plot Space Positioning

The first tab in the Plot Manager, and the tab displayed upon opening the window, is the General tab, as shown in Figure 7.2. The General tab in the Plot Manager configures basic elements relating to the selected plot space. The name of plot space and which tab it pertains to may be modified here. Also, the position of the graph area can be changed by altering the position values. The positioning values can represent either a percentage of the Plot Canvas or the corresponding absolute pixel values. The height and width of the plot can be flipped, allowing placement of a plot's axis on the opposite side. For example, a plot with a negative width will have the y axis drawn on the right side of the plot space.

The colors of the plot space can be modified in the general tab as well. These colors are a bit different from the colors specified in the Axis & Grid tab explained later. Changing the colors in the general tab affects the color behind the graph and the outline color of the graph. To change the axes, grid lines, and color within the axes limits, use the Axis & Grid tab.

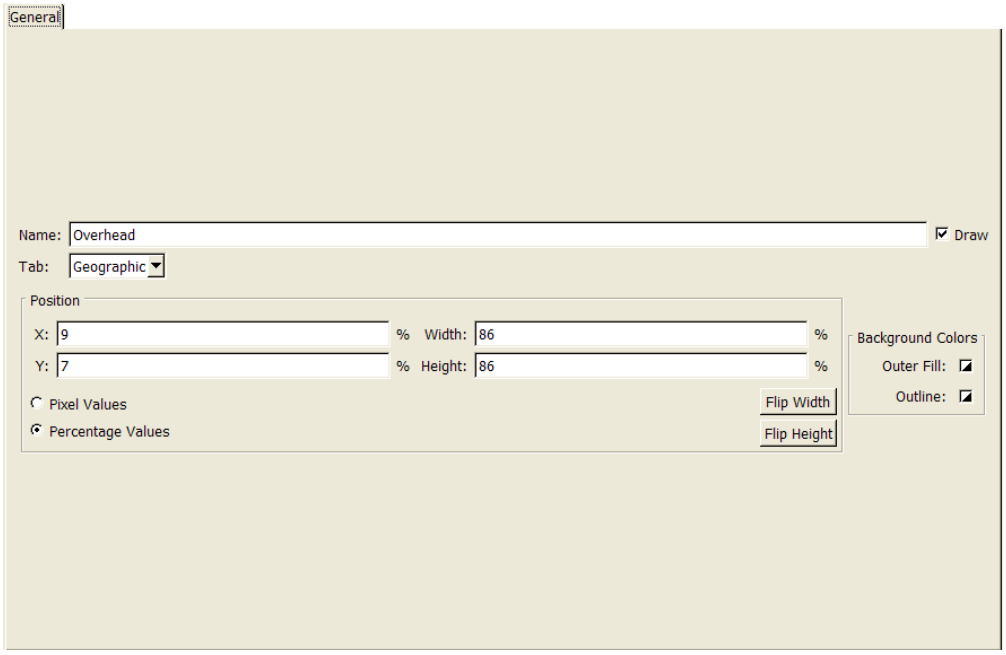


Figure 7.2: General Tab

7.1.3 Axis & Grid Tab - Axis Formatting

The second tab in the Plot Manager is the Axis & Grid tab (Figure 7.3). This tab allows various parameters to be set for the graph area drawn on the Plot Canvas. It is divided into four sections: Limits, Axis And Grid, Static Grids, Formats, and Cyclical Re-projection.

Limits

The limits section allows specific minimum and maximum x and y values to be set. These values update when the mouse is used to pan, zoom, or re-center to new locations, and serve as a keyboard interface to manipulating graph limits. Additionally, if the plot space is set to always have a one-to-one scale, adjusting one axis will cause the other axis to adjust in order to maintain the correct ratio. Also, when scrolling is enabled, these limits can no longer be adjusted manually as they would be adjusted based on the scroll lead and follow settings.

The **Flip X Values** and **Flip Y Values** buttons have the effect of swapping the begin and end values for the respective axis. This can be used to make a plot space graph from right-to-left or top-to-bottom.

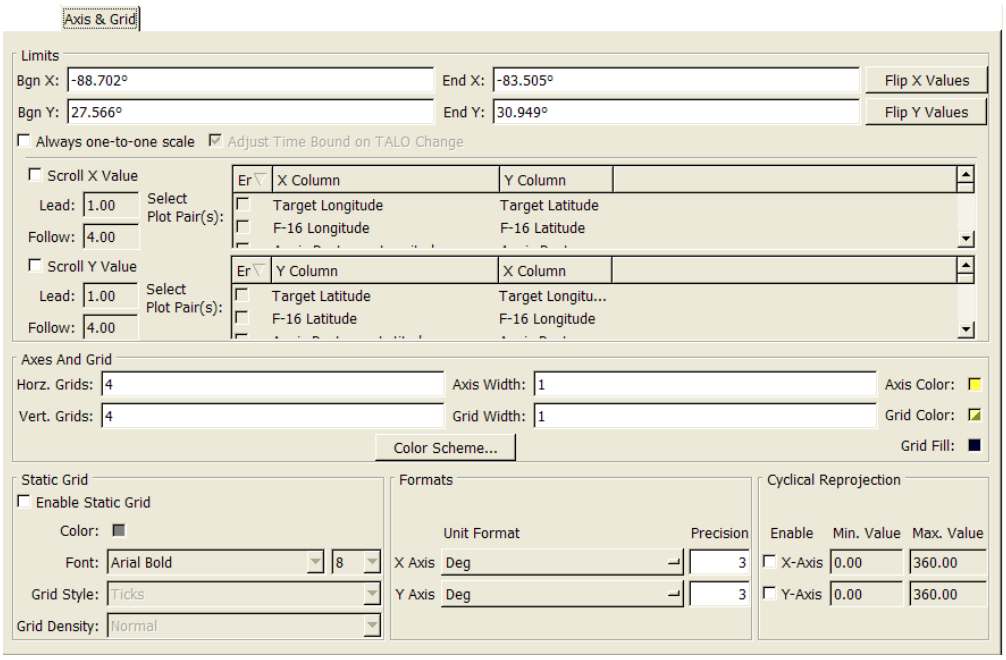


Figure 7.3: Axis & Grid Tab

The "Always one-to-one scale" option will maintain a one-to-one proportion on the selected plot space. For more information on how one-to-one works, refer to Section 6.2.4.

The **Adjust Time Bound on TALO Change** option will adjust the boundaries of the axis that is plotting time whenever the TALO value is changed. TALO stands for Time After Lift Off. This option is only available for scatter plots where either the X or Y value is time.

Scroll on x and scroll on y can be enabled in Scatter plots and Geographic plots. For each axis x and y, you can enable scrolling and then enable whichever pairs you want to scroll on. So if you want x to scroll on time only, enable the scroll on x and enable one of the plot pairs with time as the X Column. If you enable more than one plot pair to scroll on, Plot XY takes the average values of the two and scrolls on that. The lead and follow determines boundaries of the scrolling axis, so the range of the scrolling axis will always be: CURRENT_VALUE FOLLOW to CURRENT_VALUE + LEAD. Preferences can be saved and loaded via scripts.

When an axis is set to scroll, the user is no longer able to manually adjust axis bounds via Plot Manager. However, a mouse pan or zoom can change the lead and follow values of the scrolling axis, hence changing the axis bounds. Also, performing a one-to-one while both axes are set for scrolling will adjust the lead and follow settings of one axis to achieve a one-to-one ratio. Performing a one-to-one while one axis is sest to scroll will not affect the scrolling axis.

Axes and Grid

The middle section of the Axis & Grid tab provides configuration options for the number of horizontal and vertical grid lines and the width of those lines. The color of the axis lines, the grid lines, and the space behind the grid lines, but bound by the axes also can be changed. The **Color Scheme...** button launches a dialog to change the Axis Color, Grid Color, and titles simultaneously.

Static Grid

The Static Grid section at the bottom of the general tab offers users another type of grid display. When zooming without static grid enabled, scaling between each gridline changes constantly. However, if static grid is enabled, the scale of each grid remains constant until a certain threshold determined internally by Plot-XY. When this threshold is reached, by either zooming too far in or out, a new scale is used and the grid lines are redrawn accordingly. Static grids also attempt use a round scale to determine the grid spacing when zooming in and out. See Figure 7.4 for an example of static grid lines on a plot.

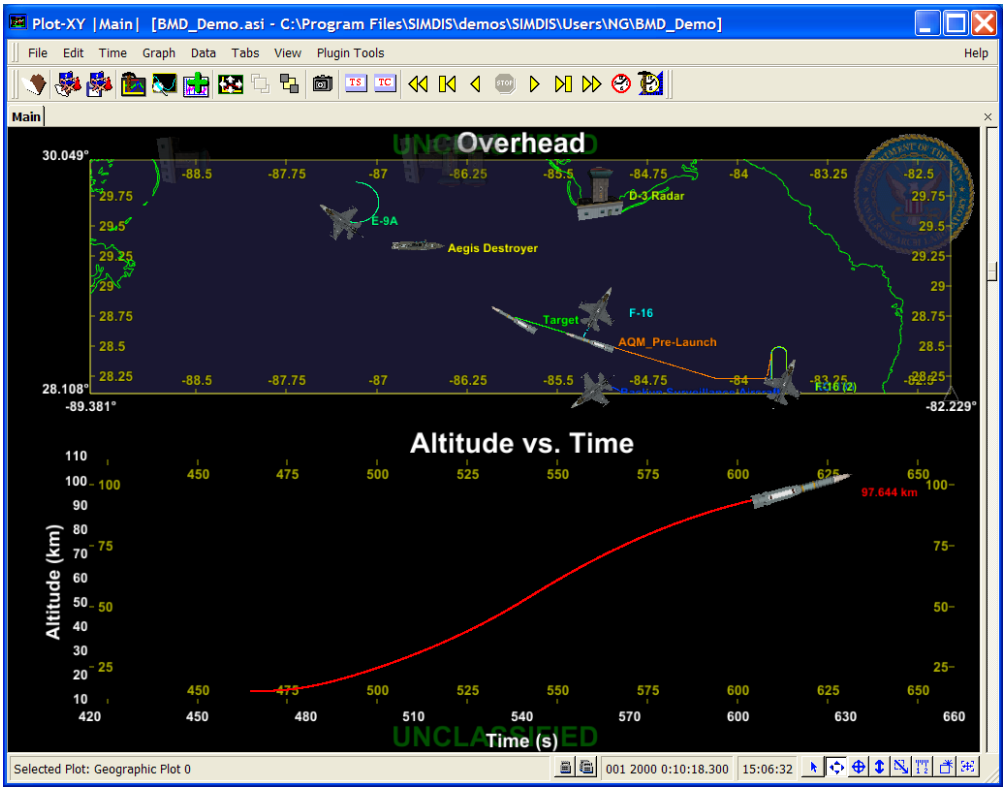


Figure 7.4: Graphical example of a plot using static grids. The yellow numbers and ticks are the static grids while the white numbers are the default grids.

Formats

The formats section at the bottom of the general tab controls the units and precision of the axes. Units may only be changed if there are plot pairs in the plot.

Cyclical Reprojection

Cyclical Reprojection is used in cases where data tracks might cross date lines or values need to be forced into specific ranges. In the typical case when a track crosses a date line, the latitude longitude values might jump from negative to positive or vice verse (-180 to +180 or +180 to -180). With Cyclical Reprojection enabled, data lines will remain smooth as tracks cross date lines (-180 to -181) if the proper minimum and maximum values are set. Furthermore, GOG overlays that cross date lines will be displayed correctly.

An example where data values may need to be forced to a specific range is in a Yaw vs. Time graph. Perhaps there is a GOG overlay with nominal data that ranges from 0 to 360 degrees, while the data ranges from -180 and 180 degrees. Cyclical reprojection will fix this inconsistency in data representation by forcing in the incoming data into a desired range (most likely 0 to 360 in this case), while maintaining the integrity of the original data values.

7.1.4 Link Axes - Axes Bounds Linking

The Link Axes tab allows axes on plot spaces to be linked so that they preserve the same min and max bounds (Figure 7.5).

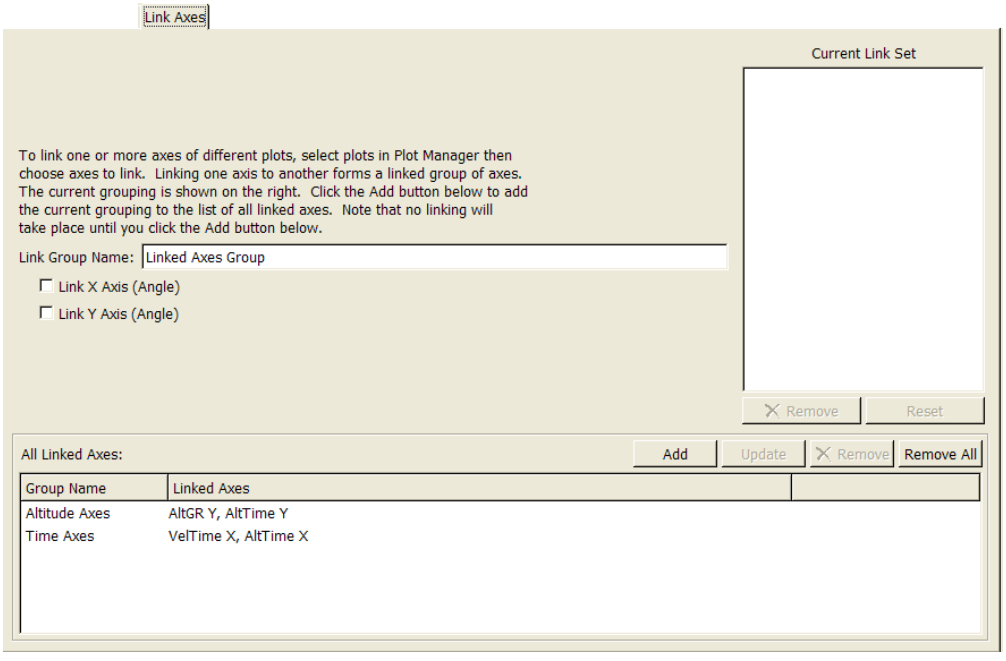


Figure 7.5: Link Axes Tab containing two sets of linked axes.

The "Link Group Name" is a name to refer to the link set. These link group names must be unique. After selecting a plot(s), clicking the link x/y axis check boxes adds the x/y axis of the selected plot(s) to the "Current Link Set" list. Before clicking the **Add** button, this list should be checked to make sure it contains all and only the axes that are to be linked. When the link group is added, it appears in the "All Linked Axes" list at the bottom of the Link Axes tab. The "Linked Axes" column displays a list of all the plots and which axis of each plot is linked with one another.

7.1.5 Data Tab - Data Manipulation

The Data manipulation frame is a starting point for working with the plot pairs in the selected plot spaces (Figure 7.6). The list in the Data tab will display all plot pairs in the selected plot space. The **Remove** button will remove the selected pairs. The **Add New** button will show the Add Data window to add new plot pairs. The **Autofit** button will fit only the selected plot pairs into the graph window. This is different from the traditional Autofit, which fits *all* plot pairs into the graph window.

The remainder of the Data tab provides a quick interface to commonly accessed fields for a plot pair such as the width and color of the data line, as well as the icon displayed. More options pertaining to a plot pair can be accessed through the Advanced Data Manager by clicking the **Advanced** button. The Advanced Data Manager is discussed in subsequent sections.

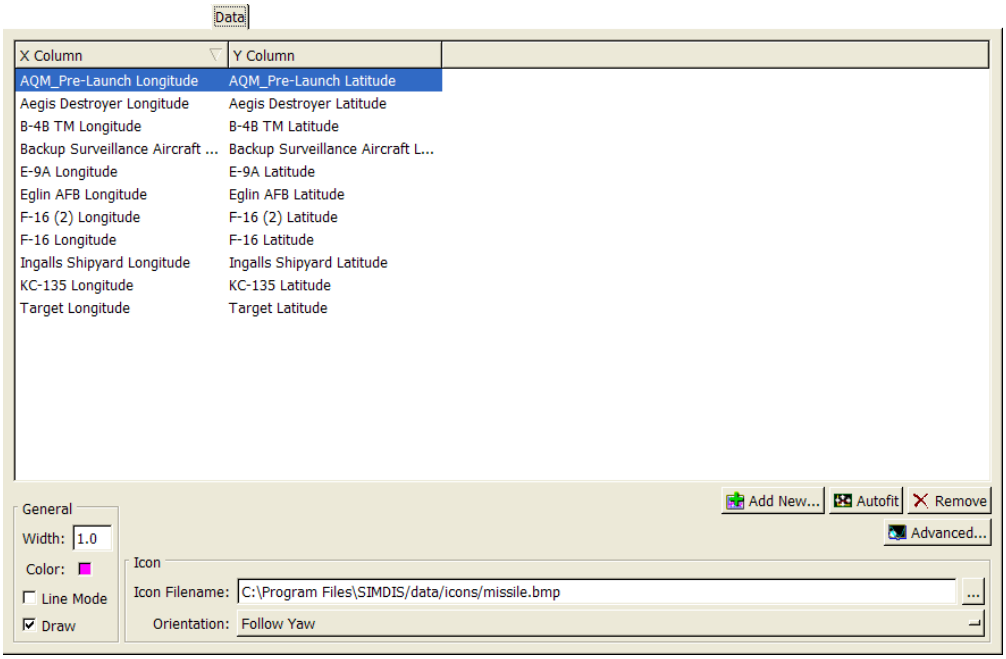


Figure 7.6: Data Tab

7.1.6 Text Tab - Modifying Text

Each plot has six distinct categories of text. They are the title, the x axis description, the y axis description, the x axis data text, the y axis data text, and the Gate Description text. Each text category can be drawn using different colors, fonts, sizes and text. The Text Tab in the Plot Manager is used to change these parameters (Figure 7.7).

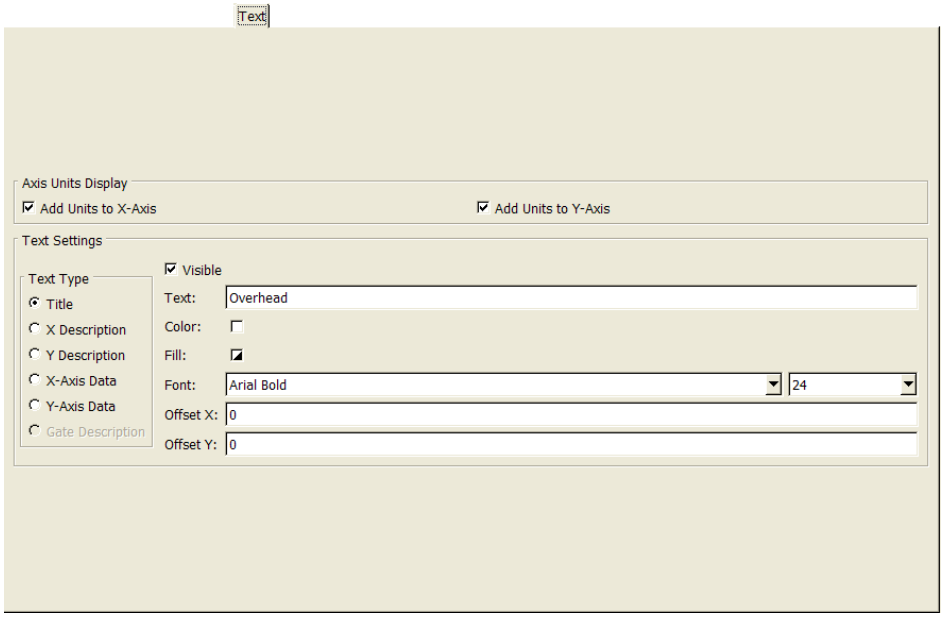


Figure 7.7: Text Tab

The Gate Description text, disabled in Figure 7.7, is text that is associated with range gates for A-Scope Plots. Hence, this text type is only displayed in A-Scope plots that include gates.

The Text Type box on the left side of the tab selects the category of text to modify. The Title, X-Description, and Y-Description categories have the same fields. The data categories (x and y Axis) do not have a changeable text field because the text for data categories is automatically generated.

Text may be turned on or off by changing the check on the **Visible** check box. When the **Text** field changes, the text on the Plot Canvas will update in the appropriate place. The text is drawn with the foreground color in the **Color** box, and a flat, square background color shown in the **Fill** box. The **Font** name and size can be changed as well.

The **Text** field is like a label field. When a plot space is created, it is initialized with a set of default labels for the title and X- and Y-axes. When plot pairs are added and removed from a plot space, these labels (displayed in the Text field) are automatically changed to reflect what the

plot space displays. For example, when a plot pair of altitude versus time is added to a plot space, the x axis text changes to "Time," the y axis text changes to "Distance," and the title becomes "Altitude vs. Time." This feature minimizes the necessary configuration for quickly displaying data in Plot-XY. However, if the label is changed the automatic feature is disabled to avoid overwriting changes.

7.1.7 GOG Tab - Displaying GOG Files

Plot-XY can display absolute and relative GOG files. GOG, which stands for Generalized Overlay Graphics, is a format for drawing vector graphics in geographical displays. GOG can also be used for drawing relative overlays on other two dimensional plots. A geographic GOG that represents a place on earth that does not move is referred to as an absolute GOG file. A relative GOG file, on the other hand, represents either a geographic GOG that is attached to a track, or any other kind of generic overlay. Absolute and relative GOGs are loaded very differently, and it is important to load using the correct method. All of this can be done through the GOG tab in the Plot Manager (Figure 7.8).

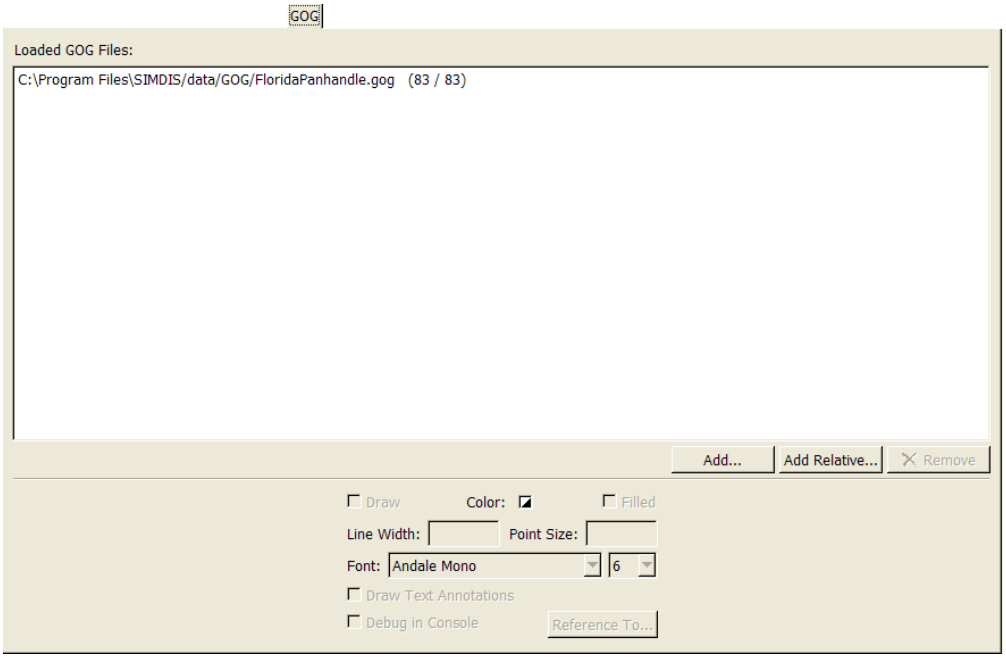


Figure 7.8: GOG Tab

Once a GOG is loaded, various options can be set through GOG tab. The color field can be set to indicate an override color for GOG files. Typical GOG files specify colors to use for display, but these colors can be changed with this tab. If the Color field is set to completely transparent, then the GOG file will default to the colors specified by the GOG file itself.

The Filled check button is a tri-state button. The checked stat indicates that all polygons, circles, and arcs will be filled regardless of the GOG file's settings. The unchecked stat indicates that all the aforementioned shapes will be unfilled, even if the GOG file requests differently. The normal, "maybe" state indicates that the GOG file alone will determine whether shapes will be filled or unfilled.

The line width and point size fields can be changed to set a default pixel width for lines and a default pixel square size for points. If either field is empty, then the default settings supplied by the GOG file will be used.

The font field can be changed to view GOG annotation text in different fonts.

The Debug in Console option will print to the console the location where the GOG is drawn. This is helpful when a GOG is loaded, but is outside the current axis extents. Each GOG has a pair of numbers following its entry in the list indicating successfully drawn GOG elements versus total GOG elements. (A GOG file can have more than one GOG element).

Absolute GOGs

Absolute GOG files specify lines, points, shapes and text to draw on the earth's surface that do not move. Examples include a map of Hawaii, a hazard pattern in the Pacific, and a road map of San Diego. Absolute GOG files can only be added to geographic plots, which displays plot pairs that include longitude along the x axis and latitude along the y axis.

To add an absolute GOG file to a plot space, click the **Add...** button and locate the appropriate GOG file. The GOG will automatically draw at the appropriate latitude and longitude once added.

Relative GOGs

Relative GOG files specify a vector relative to a given X and Y that is not a static geographical point. A relative GOG file might indicate a flight path relative to a start position, a two-dimensional radar cross section for a ship, or a trajectory for a ground range versus altitude plot. Relative GOG files can be added to any plot, and they assume that the X and Y units for the GOG file will match with the X and Y untis for the selected plot.

To add a relative GOG file, click the **Add Relative...** button and locate the appropriate relative GOG file. It will automatically be drawn on the selected plot space using (0,0) as a relative origin. The important feature of relative GOG files is that their reference origin can change. To set the reference origin parameters, click the **Reference To...** button on the GOG frame.

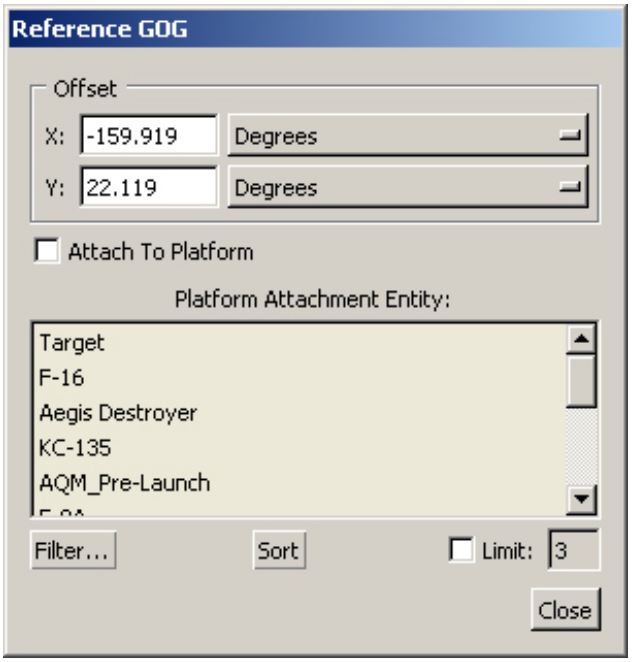


Figure 7.9: Reference GOG

A relative GOG can be relative to a given static position on the plot space or relative to a platform entity in a geographic plot. When relative to a given platform, the GOG can be offset from the platform's position by a specified amount.

To offset a relative GOG by a static position, set the X-value, Y-value, and units of that position in the fields (Figure 7.9). The values entered here serve as an offset from the platform's position if the relative GOG is attached to a a platform.

Check the **Attach to Platform** button to indicate that a platform's position should server as the reference origin of a relative GOG. This is useful for GOG files that are specified relative to the position of a platform.

7.1.8 Markers Tab

The Markers tab is used to place markers in the currently selected plot space (Figure 7.10). A marker is simply a static point, by default represented by an X, displayed on a plot space.

The top section of the marker tab allows for the specification of a marker's location, time, icon, and text. Then markers can be either added, modified, or deleted. The X and Y fields pertain to the location of the marker. The units may also be modified. If no data has been loaded into the plot, then the units may not be changed. The Time field specifies at what point in time the marker appears. The marker does not have an expiration time, so once it appears, it will remain in the plot space until it is removed. The icon field and color selector are located below the time

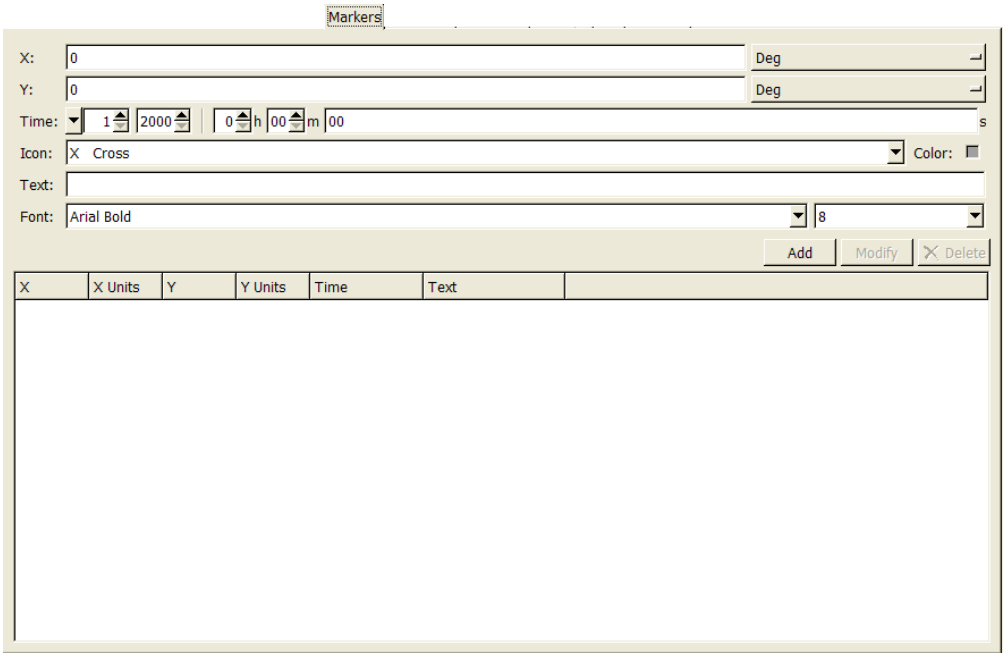


Figure 7.10: Marker Tab

field. Markers can be displayed using any icon and color. Following is the text box that contains the text that will appear next to the marker in whatever font and size specified below it.

The bottom section of the tab contains information for all existing markers. Even if a marker's information is in the top section of the tab, that marker will not be modified until the **Modify** button is clicked.

7.1.9 Time Line Tab

The Time Line section of Plot Manager enables the association of Generic Data with individual objects in a scenario and with the scenario itself (Figure 7.11). These generic data 'events' can be drawn in scatter plots.

The events are represented on the time line by either a horizontal or vertical line, or a small 'X' at the data value 0 along the time axis. Data text is drawn next to the time marker.

The event time line displays all events relating to the current scenario. Individual event data can be displayed directly on plot lines by using the 'Events' tab in the Advanced Data Manager.

The Time Line tab allows the Event TimeLine option to be enabled and the color of the text and marker, the position of the text, and the style of the marker to be specified. The text position indicated that the text will be written at a specified percentage of the plot space. For example, a

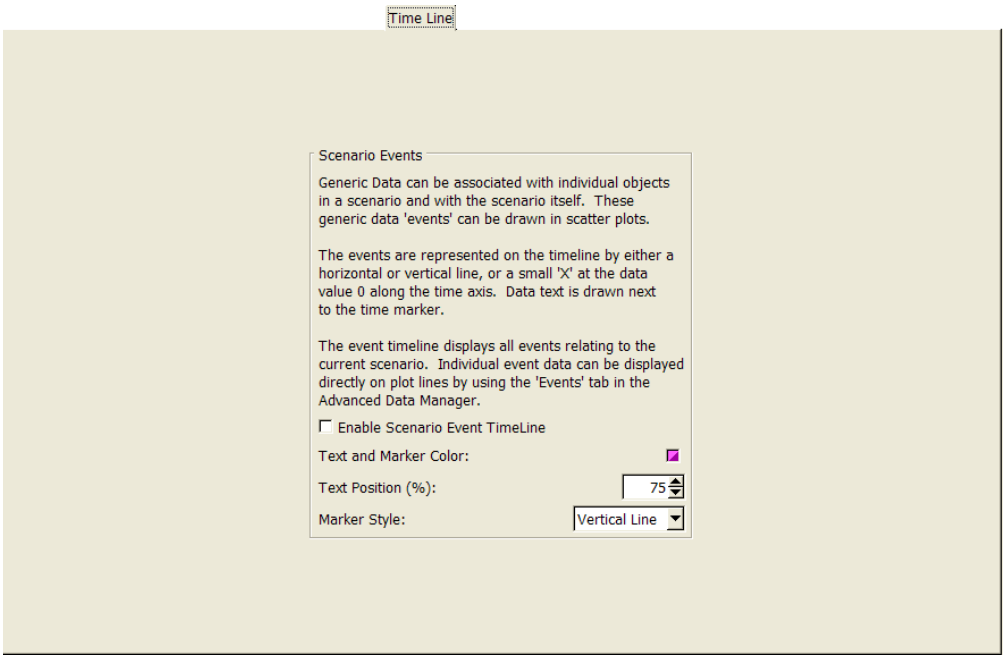


Figure 7.11: Time Line Tab

text position of 75% indicates that text will be drawn 3/4ths of the way up from the bottom of the x axis.

7.1.10 Hands-Off Tab - Hands-Off Scripting Operation

Plot-XY has the capability to automate the position of graph windows according to preset constraints. This mode, called Hands-Off Scrolling, can be set up through the Hands-Off tab in the Plot Manager (Figure 7.12).

It is not uncommon to know in advance how a graph in real-time mode should look. During a missile firing, trajectories are projected for a successful shot. A ship's course is known before other events. Plot-XY's hands-off mode can be used in these scenarios to set up viewing zones for the incoming data. A viewing zone is defined as a set of X and Y extents that defines a particular window. For example, between 4 and 60 meters for X and between 40 and 80 meters for Y. One viewing zone corresponds to the extents of a Plot-XY graph.

A hands-off script is a set of viewing zones designed to be displayed in a particular order. A script is run, activated, and begins at the first viewing zone and ends on the last viewing zone. If all tracks on the particular plot are within the bounds of the current viewing zone, then nothing of interest occurs. However, if the a track's values fall outside the viewing zone, then the next zone is activated. In other words, a new viewing window with new extents is seen in the plot space. As a zone is activated, the plot extents change to the extents of the viewing zone in a box-zoom fashion.

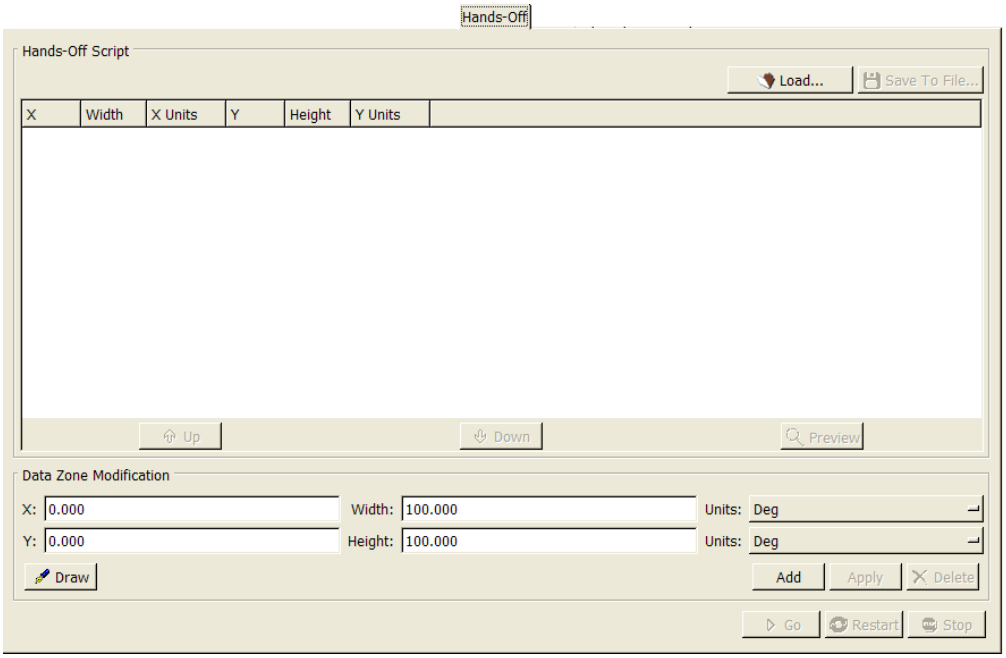


Figure 7.12: Hands-Off Tab

Typically a hands-off script will have connecting boxes so that the next box overlaps a portion of the previous box. Also, the final data zone is usually a zoomed-out view of the entire scenario, although it does not have to be configured this way.

Adding Viewing Zones

Each plot space may have its own associated hands-off script. These scripts can be saved to files and reloaded later using the **Save to File...** and **Load...** buttons, respectively. The list in the tab displays all viewing zones associated with the current plot space. Viewing zones can be moved up or down in the list, thereby changing the order in which the zones are activated. The top element of the script is executed first. A preview function is available to see the area of the data viewing zone in a zoomed-out graph.

To add a new viewing zone, the X, Y, Width, and Height fields must define the extents of the zone with the proper units. Alternatively, these values are generated automatically by using the **Draw** button, which temporarily activates the Hands-Off Drawing Mouse Mode. In this mode, simply click and drag a rectangle to the desired size of the viewing zone.

Clicking the **Add** button will add a new viewing zone to the end of the current script. **Apply** will replace the current selection in the list, and **Delete** will remove the current selection.

Running Hands-Off Scripts

When the data is ready, and the script is set up, start a Hands-Off script by clicking the **Go** button. This will activate the script in the currently selected plot space. The script will set the graph extents to the first view, and start running the script as described above. If for some reason the script must be reset, use the **Reset** button, which is equivalent to clicking the **Stop** button, followed by the **Go** button.

While hands-off scripts are active, the extents of the graph area cannot be changed by hand.

7.1.11 A-Scope Plot Configuration

The A-Scope tab is only available when an A-Scope plot is selected in the plot list (Figure 7.13). The tab shows various settings for an A-Scope plot.

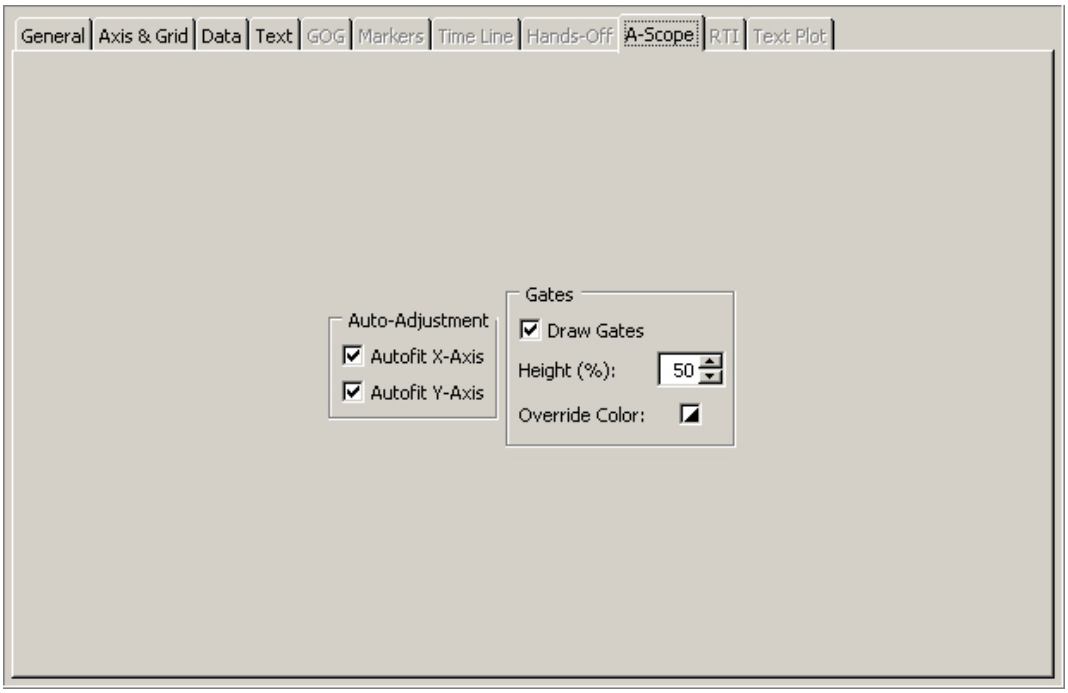


Figure 7.13: A-Scope Tab

The **Autofit X-Axis** and **Autofit Y-Axis** check buttons control whether the plot is autofit on each frame drawn. This is a useful feature for ensuring that the constantly updating data remains inside the viewing window at all times. The remaining options set the parameters for gates and gate text. If the **Draw Gates** check button is checked, range gates will be drawn on the graph area if the plug-in managing the data sends gate data to Plot-XY. The **Height** field is a percentage from the baseline at which gate description text should be drawn. For example, a value of 20% would cause all gate descriptions to be drawn about one fifth of the way up from the bottom of the

graph. Normally, the gate and gate text is drawn with a color specified by the data. However, an **Override Color** can be specified to change this behavior.

7.1.12 RTI Plot Configuration

The RTI tab is used to configure options relating to Range Time Intensity plots and is only available if an RTI plot is currently selected in the plot list (Figure 7.14).

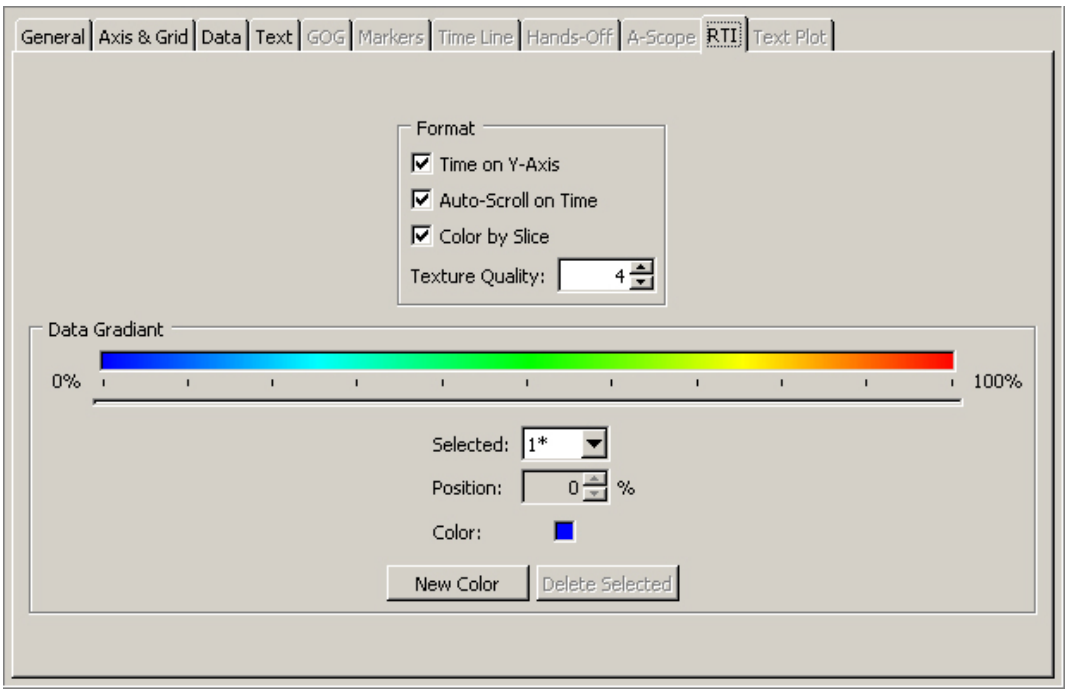


Figure 7.14: RTI Tab

The top section of the tab sets general fields relating to the RTI plot. If **Time on Y-Axis** is checked, then the y axis is used for displaying time and the x axis for range. If unchecked, the y axis is used for range and the x axis for time. The RTI plot can also scroll as time advances. To enable this feature check **Auto-Scroll on Time**.

The **Color by Slice** check button toggles between two methods for determining a particular color value. For both methods, a given return value is turned into a percentage value, which is then compared to the data gradient to get a color value to display. The difference is how the return value is converted into a percentage. If **Color by Slice** is enabled, then the percentage for a value is derived from the minimum and maximum values for the data element's time slice. If disabled, then the percentage is derived from the minimum and maximum values, known to this point, for the entire set of time slices. While the second method can often produce a smoother gradient, it can fail over a long run where the minimum and maximum return values change drastically over time. Figure 7.15 is an image with Color By Slice enabled on the left and disabled on the right.

The **Texture Quality** value determines how to balance data accuracy with application speed. Each color value in an RTI plot must be calculated for every frame, whenever the time changes, the graph area changes or the application receives new data. This operation can be very computationally expensive. With a higher quality resulting image, the application could have a significantly lower response time. The response time improves and degrades exponentially as quality is lowered and raised, respectively.

The data gradient section allows users to modify the colors returned for given percentage values. The color on the far left represents 0% and the color on the far right represents 100%. The gradient is built using control values and blending colors between the control values to create a full gradient.

There are two control colors at 0% and 100% that can change color, but cannot change position or be deleted. All other gradient control colors can be moved by using the slider just below the gradient or by typing in a percentage value in the **Position** field. The currently selected gradient control color number is changed by using the **Selected** list box. The color of a control value can be changed at any time by using the **Color** field. To create a new control color, click the **New Color**; to delete a control value, use the **Delete Selected** button. As values change in this area, the data gradient should update immediately, as should the RTI graph of data.

7.1.13 Text Plot Configuration

The Text Plot tab is used to configure options relating to Text plots and is only available if a Text plot is currently selected in the Plot Manager list (Figure 7.16).

The main part of the Text Plot tab shows all the information that is being displayed in the text plot. The user can modify the order in which the data is shown by selecting a piece of data and using the **Move Up** and **Move Down** buttons located on the right of the tab. The bottom portion of the tab allows the user to add or remove data.

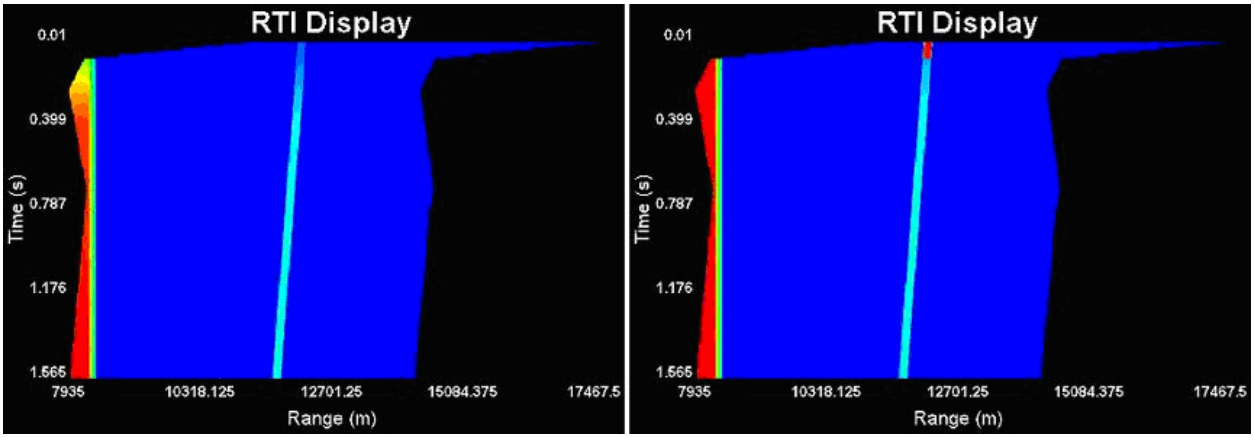


Figure 7.15: RTI Color By Slice Comparison

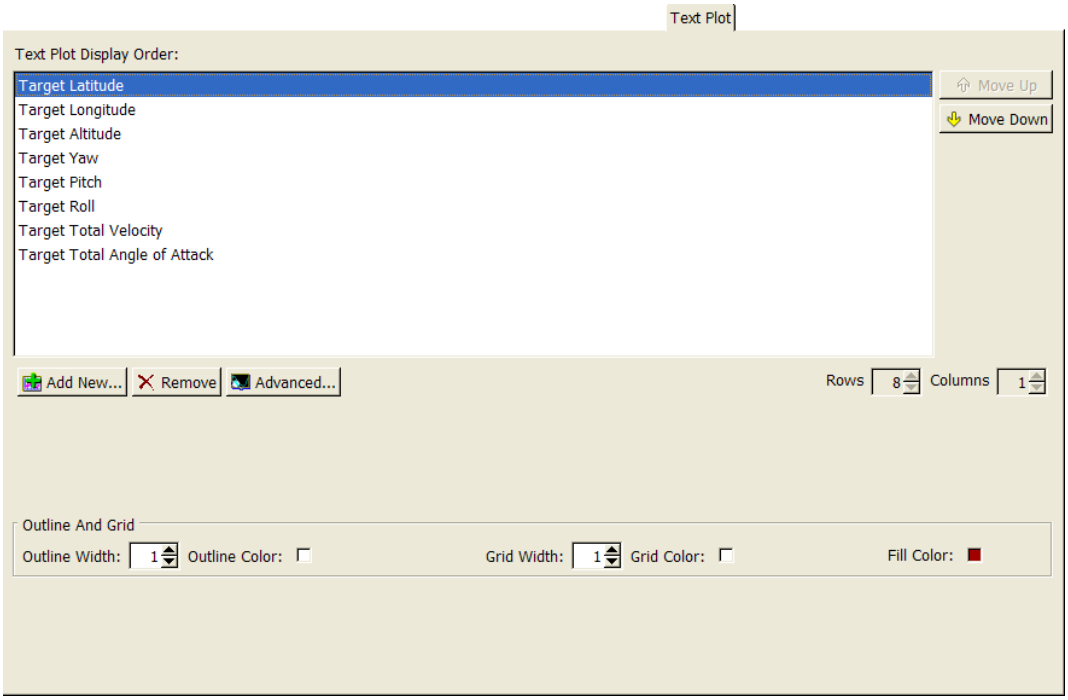


Figure 7.16: Text Plot Tab

7.2 Advanced Data Manager

The Advanced Data Manager provides an interface to manipulate parameters associated with existing plot pairs (Figure 7.17). What the Plot Manager provides for plot spaces, the Advanced Data Manager provides for plot pairs.

7.2.1 Accessing Advanced Data Manager

The Advanced Data Manager can be accessed multiple ways. The Data menu, the icon in the tool bar, and the right-click menu are all viable manners to open this window. However, note that Plot-XY must have data in the application, whether it be file- or network-based in order to open the Advanced Data Manager.

7.2.2 Plot Pair list

In the top half of the window is a list that contains all plot pairs in all of the plot spaces. The list is very similar to the plot pair list in the Plot Manager data tab. The titles of the columns in the list indicate the x and y axis values, the plot space to which the pair belong, and the tab to which the plot space belongs. Clicking on any of the column titles will sort the list accordingly. Multiple plot pairs may be selected at once for quick and easy editing.

The **Add New...** button will open the Add Data window discussed in Chapter 8. The **Autofit** and **Remove** buttons work just like those in the Plot Manager data tab. Recall that the autofit

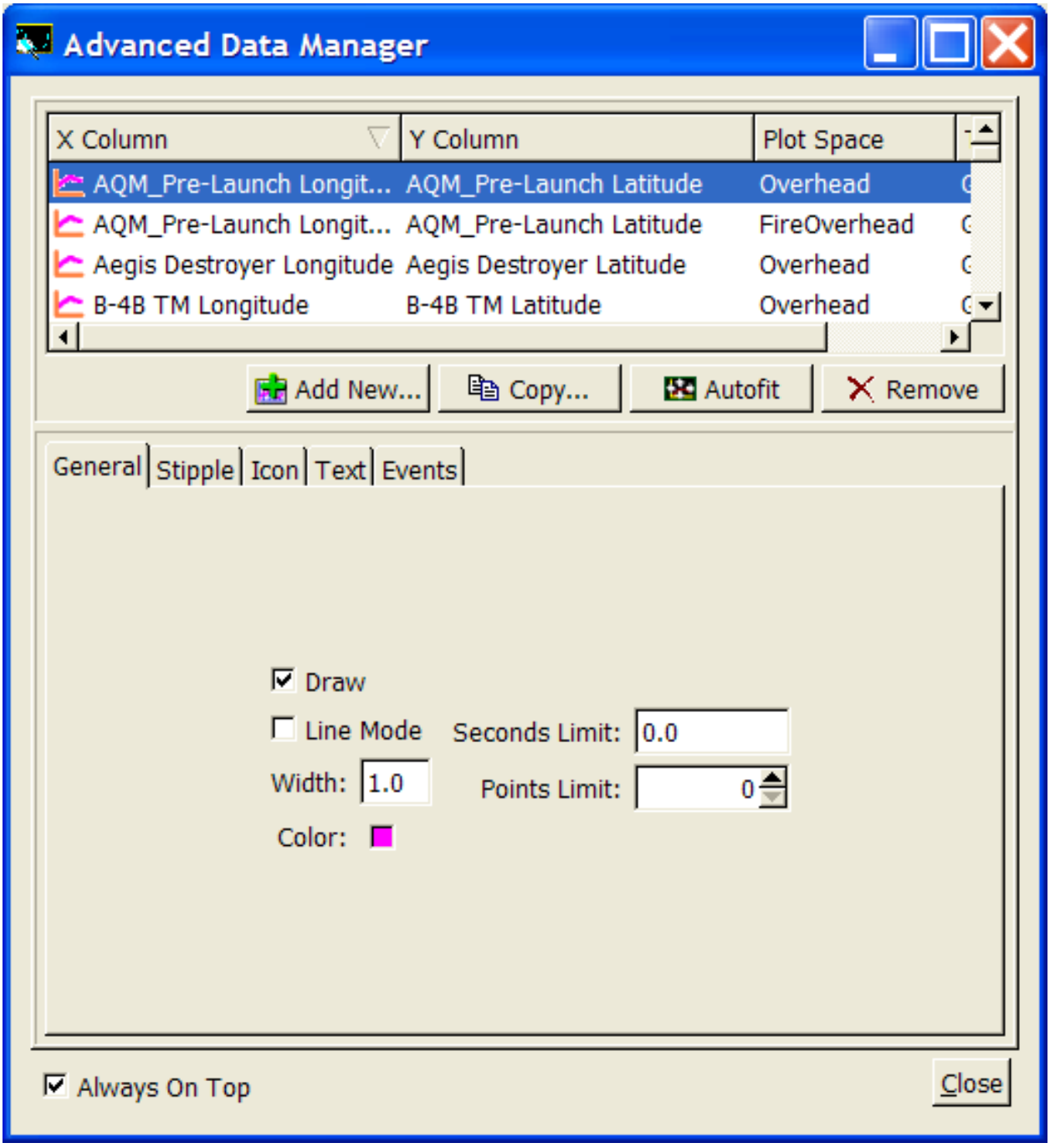


Figure 7.17: Advanced Data Manager

option here will only resize a plot space to fit selected plot pairs.

The **Copy...** button provides the capability to copy a plot pair to another plot space (Figure 7.18). The copy feature will create a new plot pair with the name parameters and add the new plot pair to the selected plot space.

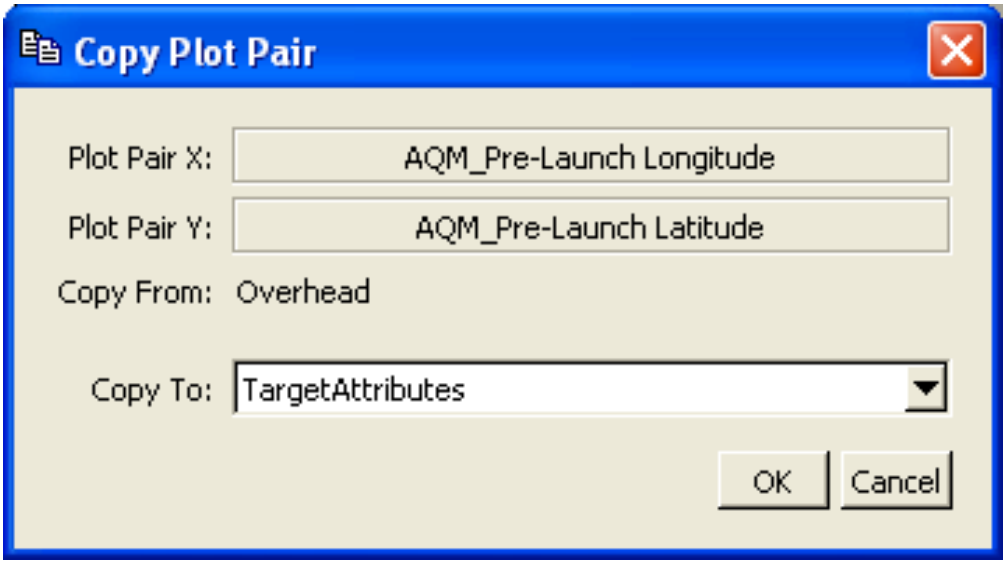


Figure 7.18: Copy Plot Pair Window

7.2.3 General Tab

The General tab in the Advanced Data Manager includes the most generic options for plot pairs (Figure 7.19). These options are also represented in the Plot Manager data tab for convenience.

If the **Draw** button is unchecked, the selected plot pairs will not be drawn on the plot space. The **Line Mode** button toggles between a linear interpolation line mode, which connects discrete points, and a scatter plot mode. The **Width** field will increase either the line width or point size, depending on the Line Mode. The **Color** field changes the color of the drawn line for the plot pair. The **Seconds Limit** field determines when, in seconds, the data will be displayed after the scenario start time. The **Points Limit** field identifies the number of data points displayed. A zero value for either the Seconds Limit or Points Limit field indicates no limit. In other words, all scenario data will be displayed.

Colors are automatically assigned to plot pairs as they are created using a linear algorithm that attempts to create a maximum contrast between successive plot pairs without duplicating colors. However, colors are certainly user configurable.

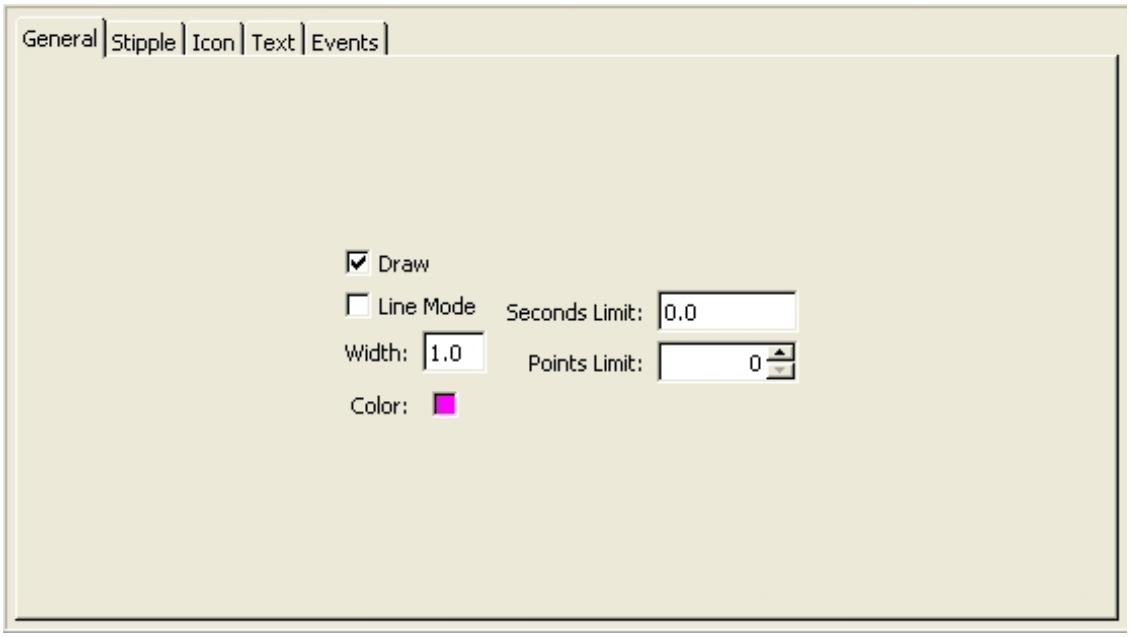


Figure 7.19: General Tab

7.2.4 Stipple Tab - Stippling Solid Lines

When a plot pair is drawn in line mode, an artificial stipple can be used to draw the line. This is controlled via the Stipple Tab (Figure 7.20). Stipple types can be used to draw dotted lines, dashed lines, or any combination of the two (Figure 7.21).

Checking the Enabled check box in this tab will activate stippling for the selected plot pair(s). If a plot pair is drawn in point mode, then there will not be a stipple effect because stippling only applies to lines. Plot-XY comes with five different stipple styles along with the capability to create and display a used-defined stipple.

Creating a Stipple

Creating a unique stipple requires that one understand how stipple patterns are generated and hexadecimal number representation. The stipple pattern is generated by a bit mask and a factor value. Selecting a predefined stipple patter will change the pattern bit mask. The bit mask is a 16-bit hexadecimal number represented by four hexadecimal digits. The hex value is decoded to binary digits for determining the actual pattern to draw. A `1` in the pattern indicates a filled pixel and a `0` indicates an empty pixel.

For example, to create a dotted line, the stipple would be a series of alternating `1`'s and `0`'s: `1010 1010 1010 1010`. Putting the numbers together in hex forms the hexadecimal number `0xaaaa`. Note that a dotted line could also be created from the pattern `0101 0101 0101 0101` or `0x5555`.

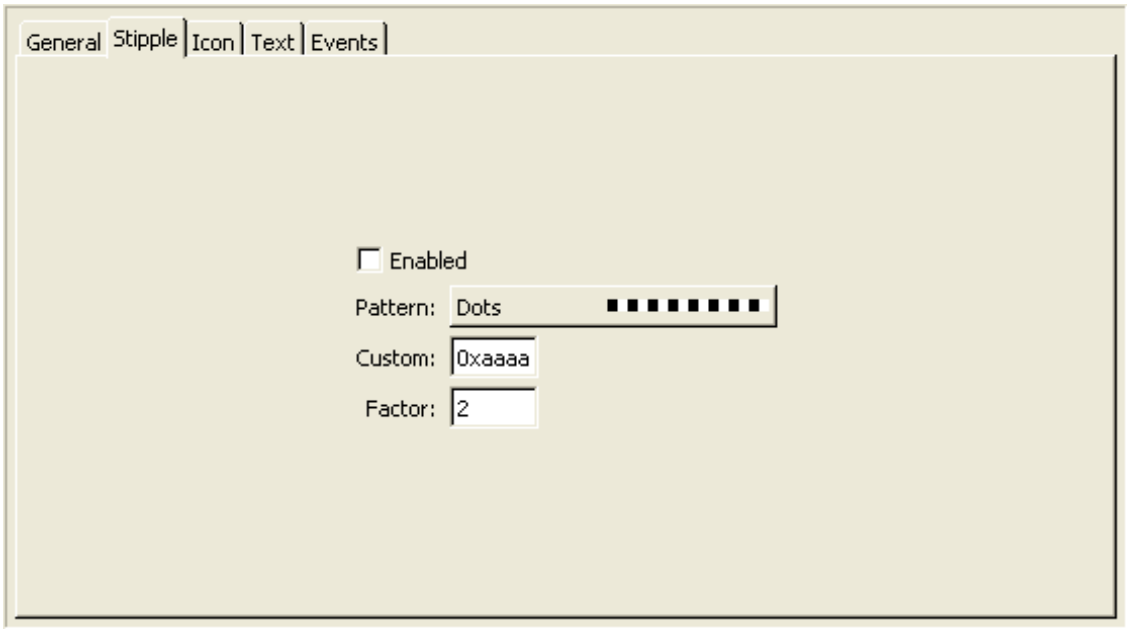


Figure 7.20: Stipple Tab

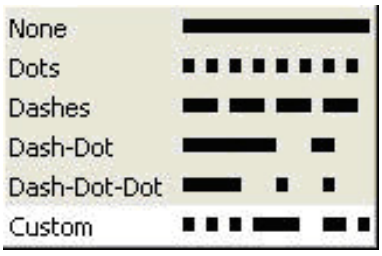


Figure 7.21: Stipple Styles

The second version starts with a blank instead of a filled pixel. Using a patter of on- and off-bits, one can create a complex stipple pattern.

The factor value is like a stretch value and determines how many pixels a `1` or `0` represents. For example, a mask of `1010 1010 1010 1010` with a factor of 4 would look exactly the same as a mask of `1111 0000 1111 0000` with a factor of 1. This is because in the first case the factor of 4 indicates that a single `1` uses 4 pixels. In the second case each `1` represents a single pixel because the scale factor is 1.

7.2.5 Icon Tab - Icon Assignment

Each plot pair can be represented by a two-dimensional icon. The icon is drawn at the last known X and Y value. Icons are represented by graphics files on the disk drive and are assigned automatically based on the entity and platform type of the data. Information pertaining to a plot pair's icon is displayed in the icon tab of the Advanced Data Manager (Figure 7.22).

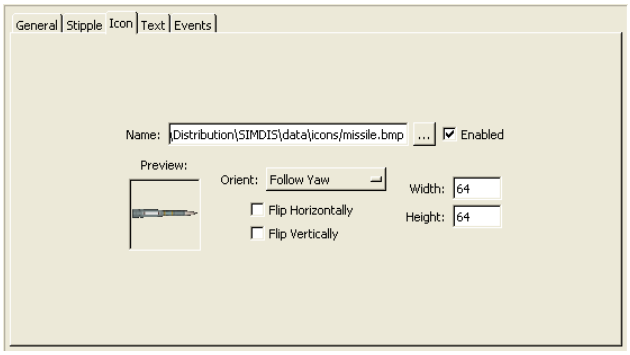


Figure 7.22: Icon Tab

The current icon of a plot pair can be viewed in the **Preview** frame. The **Name** field changes the filename of the icon. Icons can be extracted from Microsoft Bitmap, Compuserve GIF, and X Pixmap icons (`*.bmp, *.gif, *.xpm`).

The width and height fields are filled automatically based on the size of the icon as indicated in the file. Simply enter new values to change the size of the icon displayed in the plot space.

Icons come in two styles: top-down and side icons. When an icon is assigned automatically to a plot pair, a top-down or side icon is chosen automatically based on the data and plot. A Ground Distance vs. Altitude plot, for example, would draw a side icon, while a Latitude vs. Longitude plot would draw a top-down icon.

Icons can orient differently based on either a constant factor or a calculated value. Yaw, pitch, roll, course, flight path angle, or at any ninety degree increment are the possible ways an icon can be oriented. This is selected from the Orient drop down menu. A default orientation is assigned to each plot pair based on the data and the plot. An overhead Latitude vs. Longitude plot might use either Yaw or Course, while a side-view Ground Distance vs. Altitude plot might use Pitch or Flight Path Angle for the orientation. Yaw and Pitch are used by default for the previous plot pair selections. However, if the data does not have yaw or pitch fields, then Course and Flight Path Angle are used.

7.2.6 Text Tab - Text Overlay Options

In addition to icons, text can be displayed at the current data point position in order to better identify the plot pair. The Advanced Data Manager's Text tab (Figure 7.23) configures the options for the text pertaining to a plot pair.

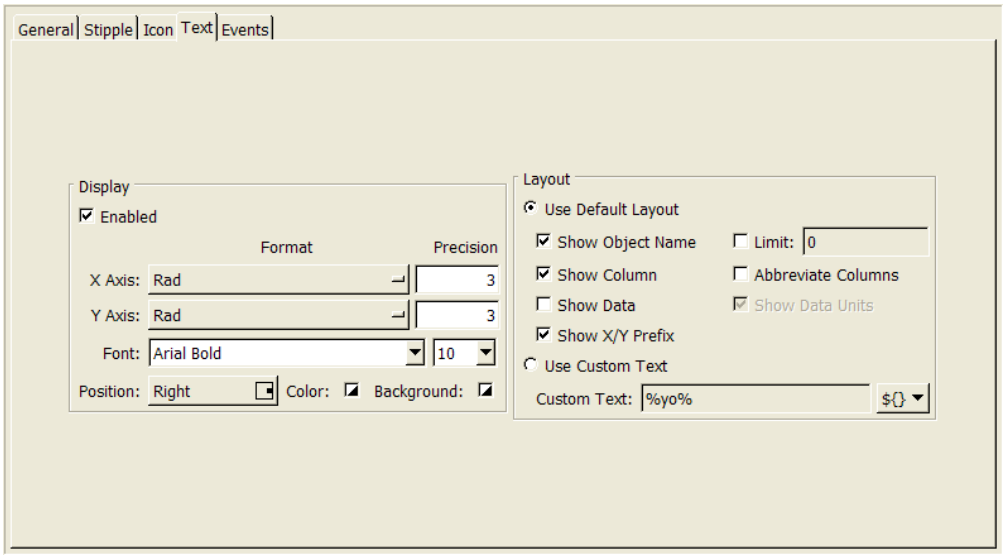


Figure 7.23: Text Tab

The text tab is divided into two sections, Display and Layout. The Display section configures the text overlay's color, font, format, and location. The background color is typically transparent, but this can be changed. The text color defaults to the same color as the line for the plot pair. In Figure 7.24, the text color was manually changed to green. If the text color is set to transparent, then the plot pair line color will be used. Finally, the position of the text with respect to the data point can be set using a drop down menu.

The Layout section configures the text overlay's content. When selecting the Default Layout, two lines of text are displayed with a plot pair. The first line is for the X data and the second line for the Y data. The **Show Object Name** check box will display the name of the entity in the

text if checked. In Figure 7.24 the object name is Bogey. An optional character limit can be used to truncate the name to a given number of characters. The **Show Column** field can be changed to toggle the display of the parameter title. In Figure 7.24 the column, or parameter, is Altitude. In the X line, Time is considered both an object name and a column, so checking either button will display this text. The column names may be abbreviated (Altitude becomes Alt) by checking the appropriate box. As shown in Figure 7.24, the current data and data units can also be displayed in the text overlay. Checking the **Show Data** and **Show Data Units** boxes control this behavior. Checking the **Show XY Prefix** allows users to show/hide the X/Y Prefix from data labels.

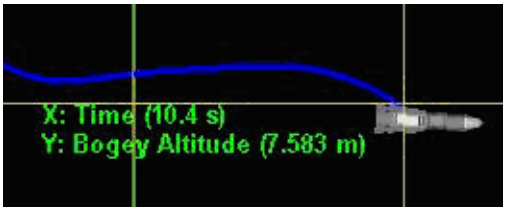


Figure 7.24: Plot Pair Text

One can determine what is displayed in those lines by checking the appropriate check boxes. By selecting the Custom Text option (Figure 7.25), users can specify custom labels for the plot pairs that can include regular text, or a number of variables (like an object name or data value) in a free form layout as they wish. Users are able to type in their own values in the text field or use the drop down menu to populate the field.

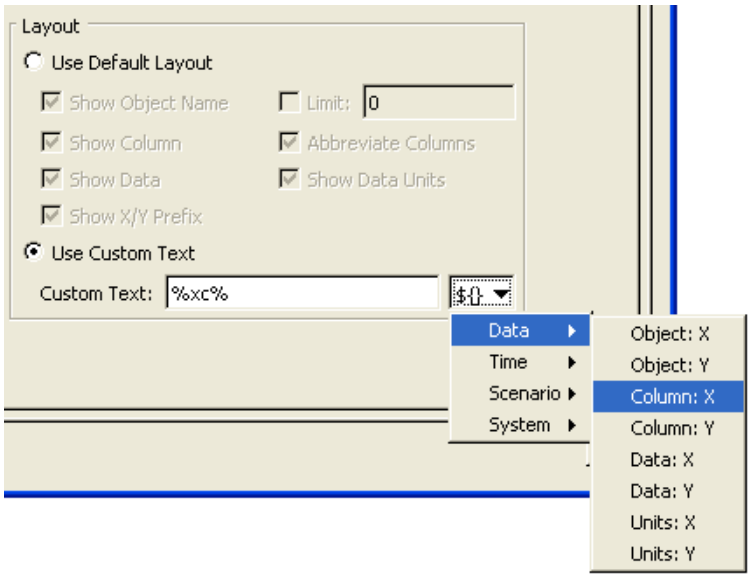


Figure 7.25: Use Custom Text Menu

7.2.7 Events Tab

The Events tab allows for the display of events for select entities (Figure 7.26). An event is a textual piece of data, like a marker, that is associated with an entity at a specific time. A marker is different because it is only associated with a plot. Events are associated with specific plot pairs. If one is familiar with SIMDIS, events are also called Generic Data. Event data, or Generic Data, is specified by the data source, typically an ASI file. Events are a means to display text on a data line. The Events tab is the interface to adding event data to a plot pair on a specified plot space.

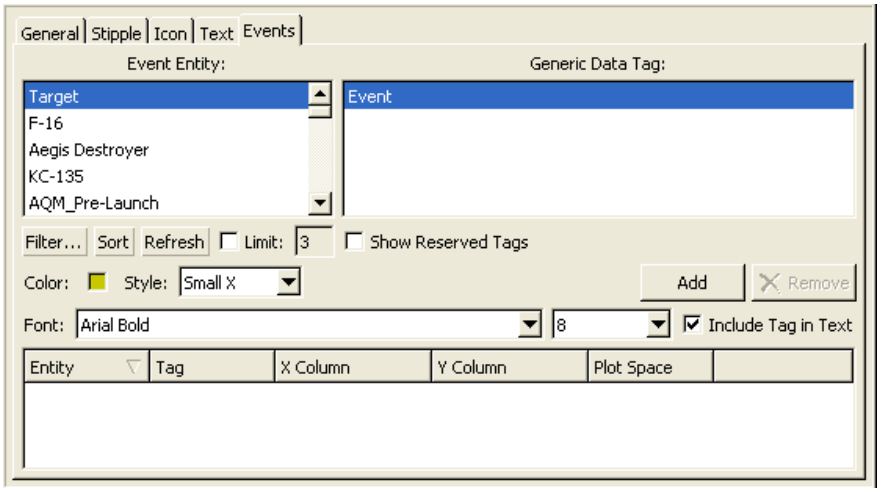


Figure 7.26: Events Tab

The list on the left of the tab shows all the data entities loaded into Plot-XY. When an entity is selected, the list on the right side of the tab is populated with the events (Generic Data) associated with that entity, if there are any. Once again, events (Generic Data) will only be associated with an entity if it is specified in the data source. There is no way to manually add events to entities, only to add existing events to plots. To add something like an event, use markers in the Plot Manager.

To add the event to a plot click the **Add** button and notice the appearance of the event in the list at the bottom of the tab. The information in the bottom list indicates what entity the event is attached and on which plot space the event appears. To add the same event on a different plot change the plot pair selection at the very top of the tab, select the entity and associated event, and click the **Add** button again.

To change how the event is displayed in the plot space use the options just above the event list at the bottom of the tab. Change the color of the event by clicking the color box. Switch between displaying a Small X or a Vertical Line for the style of the marker. Note, however, that vertical lines make most sense on plots whose x axis is Time. One may also change the font and size of the event, as well as whether or not the event tag is displayed in the text.

Please note that, although events are identical in appearance to markers and time line scenario events, they are different. Markers and time line scenario events are associated with plot spaces and thus the interface to control their functionality is in the Plot Manager. Events, however, are actual data associated with a plot pair. That is why the interface is in the Advanced Data Manager.

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Chapter 8

Other Plot-XY Dialogs

What are the other Plot-XY dialogs and what do they do?

Thus far we have discussed the Add Plot Pair window, the Plot Manager, and the Advanced Data Manager. Although these are the most commonly used dialogs in Plot-XY, several other dialogs allow further customization of the application. This chapter discusses the other dialogs in Plot-XY namely the Track Status Dialog, the Annotation Editor, the Local Time Controls, the Classification window, and the Options dialog.

8.1 Track Status Dialog

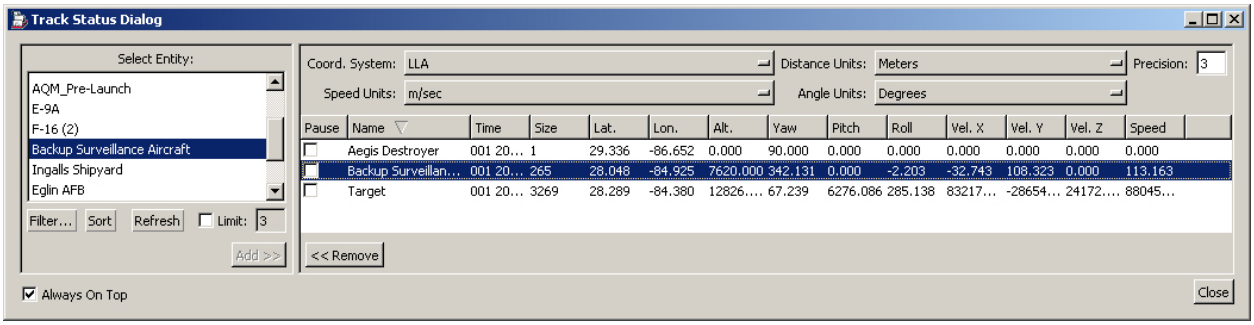

Figure 8.1: Track Status Dialog

The Track Status Dialog is used to analyze data (Figure 8.1). The window can be used to display the current TSPI (time space position information) data in chart format for each data entity currently in Plot-XY. Platform entities are selected from the list on the left side of the window and added to the chart on the right side using the **Add** button. Individual items in the track data chart can be "paused" at times of interest by checking the box to the left side of the data line. Pausing an item simply freezes the data values in the line so it is easier to see them. Pausing does not stop the data flow. Items that are not on pause will update their values at a

regular interval. Coordinate systems and units can be modified in order to display the data in the chart differently.

8.2 Annotation Editor

The Annotation Editor is used to add text annotations to the Plot Canvas (Figure 8.2). An annotation is a textual overlay, like a note, on the Plot Canvas. The window is divided into three sections. The top most section is a list of annotations currently configured. Upon starting Plot-XY this list will be empty. The middle section of the window allows for the position of an annotation to be set in several ways. The bottom part of the window includes settings for the actual text that is displayed.

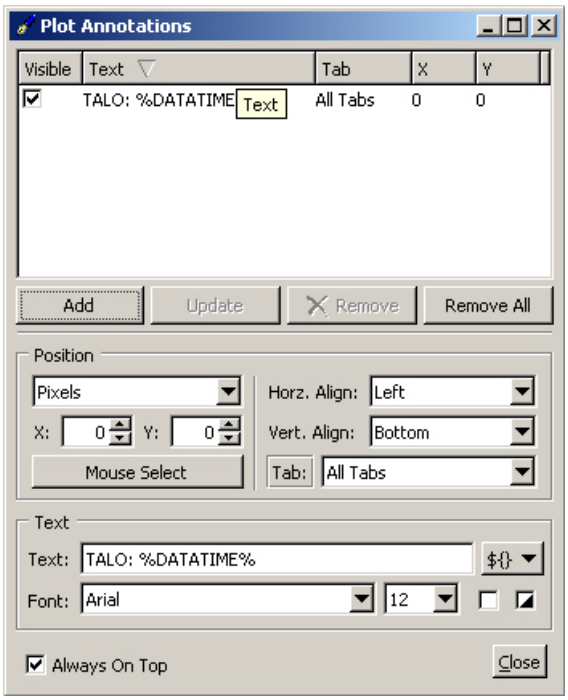

Figure 8.2: Annotation Editor

Annotations are created by entering position information and the text, followed by clicking the **Add** button. The text will immediately display on the Plot Canvas of the selected tab. To edit the annotation select it from the list, make the desired changes, and click the **Update** button. To temporarily disable an annotation without deleting it, check the **Visible** check button to the left of the annotation in the list.

The middle section of the window controls where an annotation appears on the Plot Canvas and on which tab(s). Positions are specified in either screen pixels or a percentage of the entire window from the lower left corner of the Plot Canvas. The **Mouse Select** button will allow one to

click on the Plot Canvas to select a position and will automatically fill in the X- and Y-positions automatically. The position is a specific point, but the **Horz. Align:** and **Vert. Align:** drop down menus specify how the text is aligned based on a general desired location on the canvas.

The bottom section of the Annotation Editor controls the text to be displayed. To the right of the Text field, chose user variables to appear in the annotation, if so desired. Click the drop down menu with the symbols on it to select a variable, such as system time. Text is displayed in various fonts and sizes with any foreground and background color.

8.3 Local Time Controls

The Local Time Controls dialog controls time in Plot-XY while in file mode (Figure 8.3). The time buttons in the tool bar and the time scroll bar to the right side of the Plot Canvas allow for basic time controls whereas the Local Time Controls window provides more control.

The Local Time Controls window permits the manipulation of the application time. The first two buttons toggle between Time Server and Time Client mode. When in Time Server mode, Plot-XY broadcasts the current data time using multicast packets in the SIMDIS Time Client Server (TCS) format. Other applications such as SIMDIS and SIMDIS Media Player can enable Time Client mode to read the TCS packets and synchronize with the time server. Similarly, if Plot-XY is in Time Client mode, another application must be in Time Server mode so that Plot-XY can receive time packets and synchronize with the other application.

The VCR-like buttons, following TS and TC, are used to modify how time advances in the application. The buttons are described below.

 and  slow down and speed up the play speed by decreasing/increasing a time step.

 and  step back and step forward one time step, respectively.

 and  play the scenario backwards and forwards, respectively.

 stops the time progression of the scenario.

 toggles between real-time and step mode. In realtime mode, the step factor is ignored forcing time to advance in real-time.

The slider bar below the control buttons is used to move the time in reference to the scenario time bounds. It has the same functionality as the scroll bar to the right of the Plot Canvas. The far left represents the beginning of the scenario and the far right represents the end of the scenario.

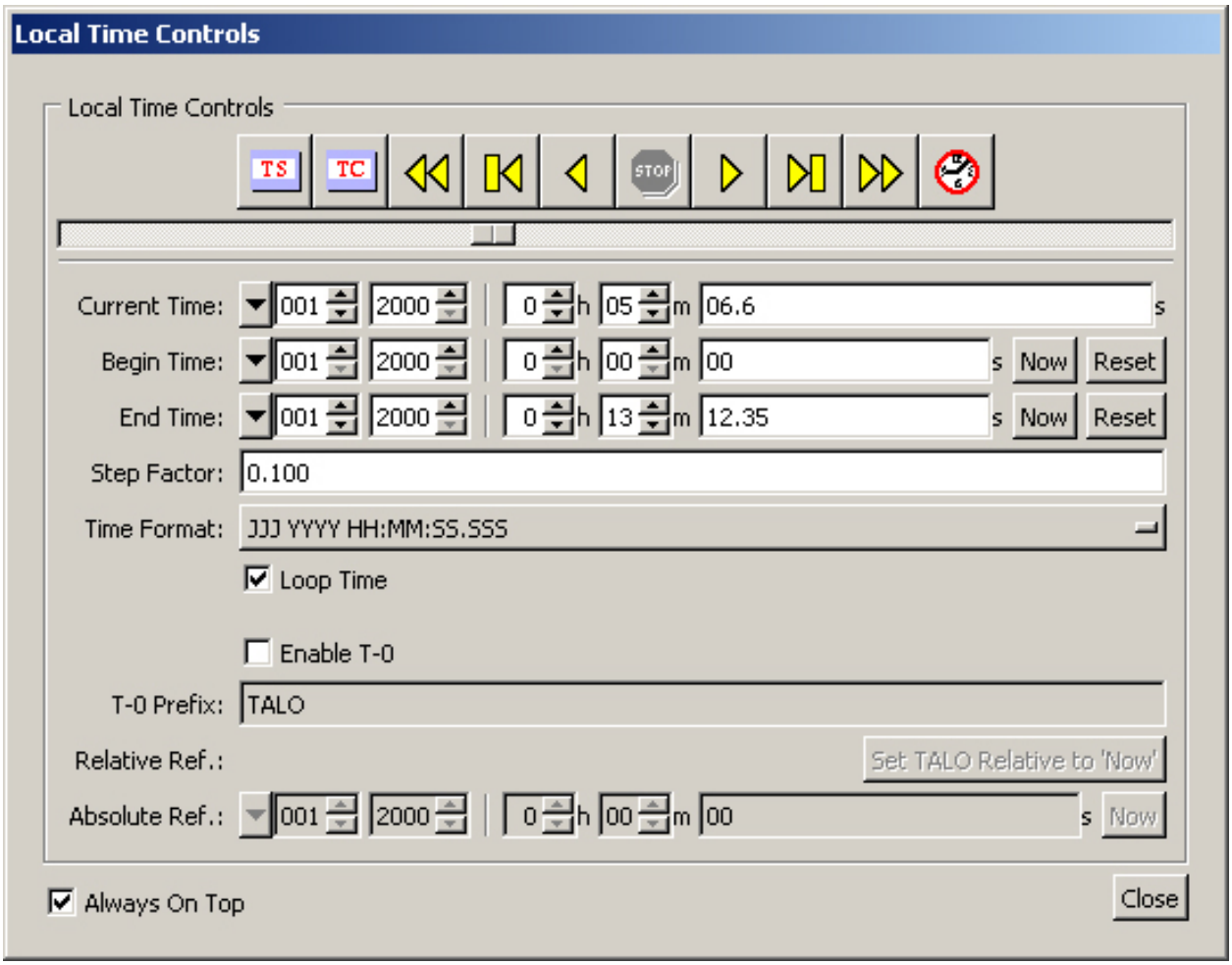

Figure 8.3: Local Time Controls

The current time text field displays the time in the scenario as time changes. The begin and end time values can be modified to select a subset of data to view. These fields both have a **Now** button, which sets the value to the current scenario time, and a **Reset** button, which resets the time values to the original data file time bounds. The step factor indicates the amount of time that elapses between frames in step mode or the multiplier of real-time when in real-time mode. Step factor is controlled by  and  . One may also change the format in which time is displayed and have the scenario continuously loop through time.

While most of the functionality in this window can only be achieved in file mode, T-0 can be used in both file and live mode. T-0 stands for time zero and refers to a TALO (Time After Liftoff) offset. T-0 mode keeps track of a specified time (time zero) and displays all other time as an offset from time zero. For example, 5 seconds after T-0, 1 minute after T-0, or 10 seconds until T-0. Time zero can be specified as an absolute point in time or relative to "now" in Plot-XY. For example, suppose a liftoff occurs at time 30 seconds and the current Plot-XY time is 25 seconds. To specify

the liftoff time as T-0, either type `30` into the absolute reference field, `5` into the relative reference, or wait 5 seconds and click the the **Now** button.

8.4 Classification

Normally the data plug-in is responsible for changing or setting the classification of a scenario. However, one might desire to change the text or color of the classification text for various reasons. Use the Classification window to do so (Figure 8.4). Simply edit the text, the color, and the always on top option as desired.

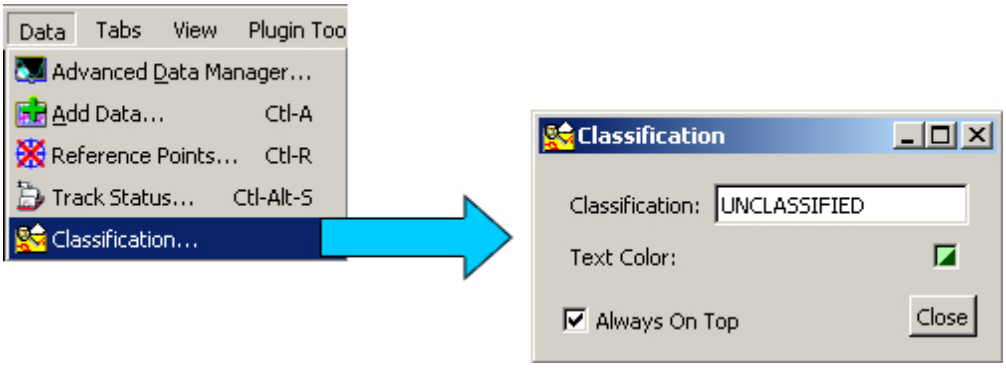

Figure 8.4: Classification Window

8.5 Hot Keys Dialog

Actions in Plot-XY can be assigned to and activated by keyboard combinations called Hot Keys. Hot keys can be used to change the mouse mode, start or stop time, open files, or any other action in Plot-XY. Plot-XY is distributed with a default set of hot keys listed in Appendix A. Hot keys can be reassigned and reorganized in the Hot Key Configuration window, accessed through the Views menu.

The configuration window contains a list of all possible actions in Plot-XY (Figure 8.5). Each action can have two hot keys assigned to them: a primary hot key, and a secondary hot key. When more than one key combination is assigned to an action, only the primary hot key is shown in the menubar menus, however both key combinations will work as assigned. Actions are grouped together in a similar way to how they are displayed in the menu system. For example, the **Open** action is under the File grouping since **Open** is found in the File menu.

To assign a hot key to an action, click the button next to the action in either the Primary or Secondary column as desired. A window will display asking you to press a key combination (Figure 8.6). You may use any combination of control, alt, and shift along another key to set the desired

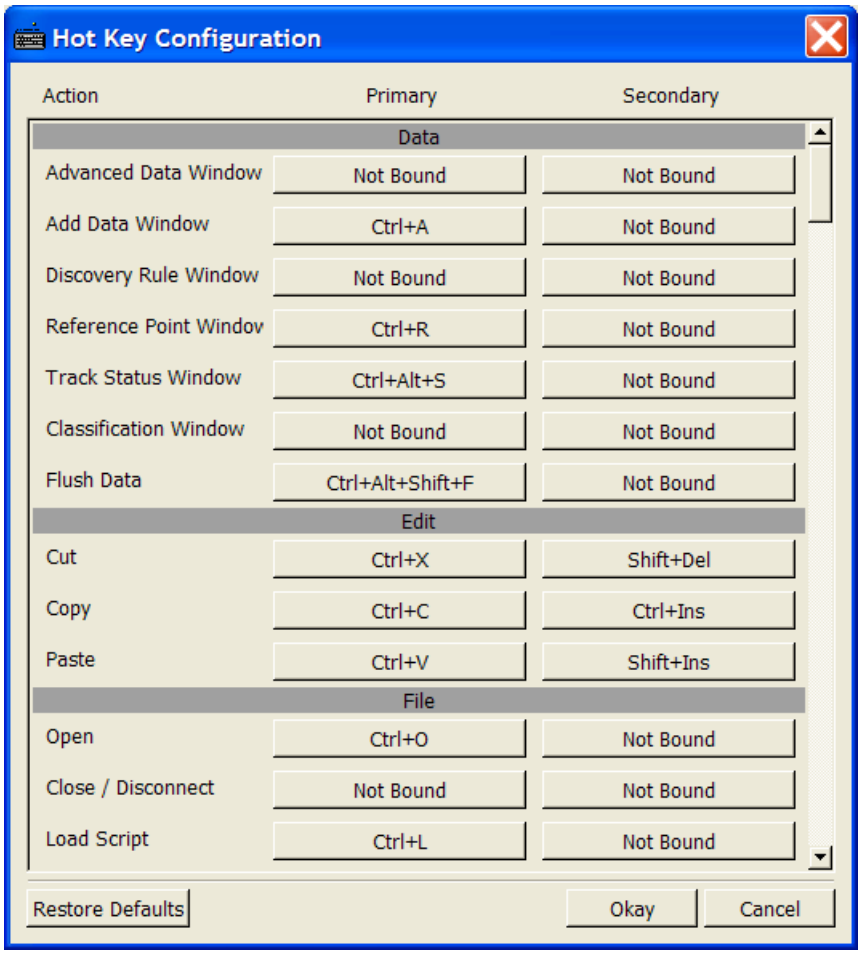

Figure 8.5: Hot Keys Dialog

combination. Control, alt, and shift do not count as valid keys by themself, but instead are modifier keys; for example, Control-A is a valid key combination, but Control by itself is not.

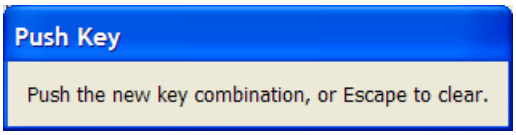

Figure 8.6: Hot Keys window for new key assignments

A hot key combination can only be assigned to a single action. If a hot key combination is reused, it will be unassigned from the previous action before being assigned to the new action. When this occurs, a notice is displayed along the bottom of the configuration window (Figure 8.7).

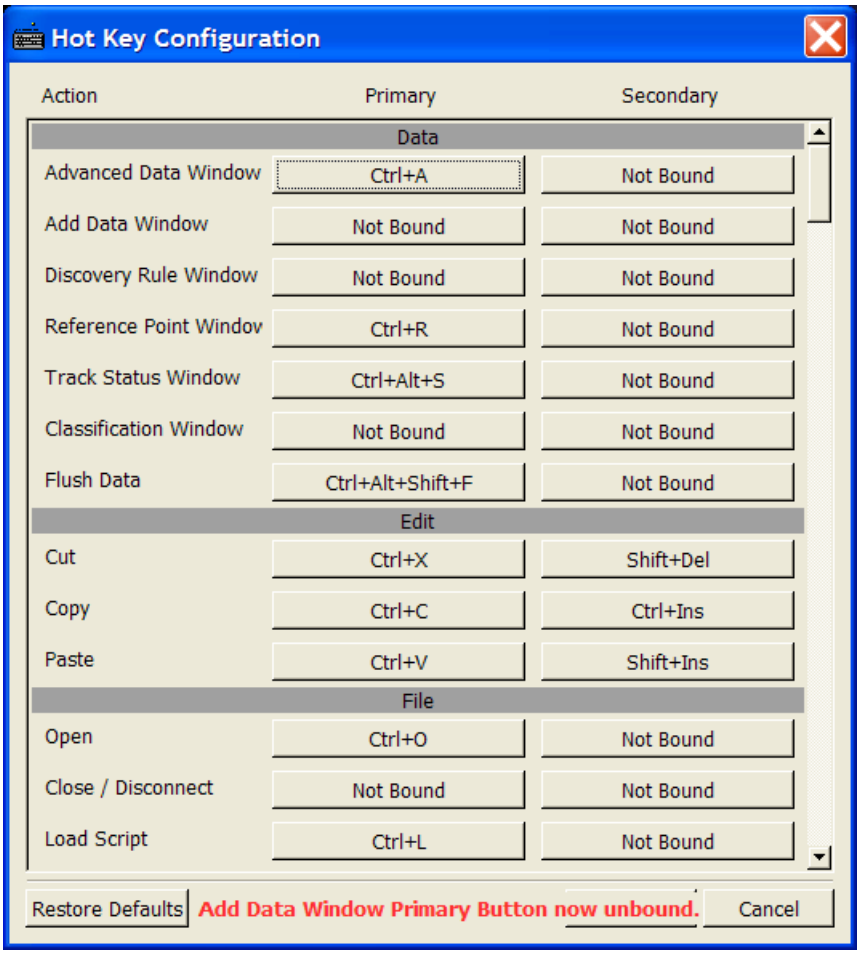

Figure 8.7: Hot Keys dialog with warning message at the bottom

Not all actions have hot key assignments. When an action does not have an assigned hot key, the text “Not Bound” is displayed on the button in the configuration window. The action of assigning

a hot key to an action is referred to as "binding" the hot key, since a hot key combination can only refer to a single action at a time. If no hot key is assigned to the action, then that action's hot key entries are not bound.

The changes to the window are not accepted until the **Okay** button is pressed. Use the **Cancel** button to revert changes since the window was last opened. The **Restore Defaults** button will reset all hot keys to factory default settings, as indicated in Appendix A.

Settings for the hot key configuration are contained in the application's registry. Under Windows, this is stored in the system registry; under UNIX environments, this is stored in the user's HOME directory.

8.6 Options Dialog

There are several user configurable options in Plot-XY. The options are controlled through preferences, which can be saved to files and loaded. All of this in controlled via the Options Dialog (Figure 8.8) that is opened by selecting the **Options...** item in the Graph menu. Remember: it is strongly recommended not to modify the `plotxy.prefs` file in the `$(SIMDIS_HOME)` directory. Instead modify (or create one for the first time) the `myplotxy.prefs` file in the same directory. This is because the `plotxy.prefs` preferences file will be overwritten by the system under certain circumstances, whereas the `plotxy.prefs` will not.

Many options in the Options Dialog are self-explanatory. Hovering the mouse over the label for an option, a tool tip will display functionality of the option. In addition the application status bar will update to provide more information if necessary. There are, however, certain options that deserve further explanation.

The first item of note is changing an option will have no effect on Plot-XY until the **OK** or **Apply** button is pressed. However, once the changes are applied they cannot be canceled.

The category list on the left side of the window changes the frame displayed on the right to reveal even more options.

The Units category (second to last) is used to change default units in Plot-XY. When data is added to an empty plot space, the plot space automatically inherits the unit types of the data is graphs. For example, when graphing altitude vs. time, the x axis units is time and the y axis units are distance. Application default options, however, determine the format of the unit type such as meters for distance and seconds for time.

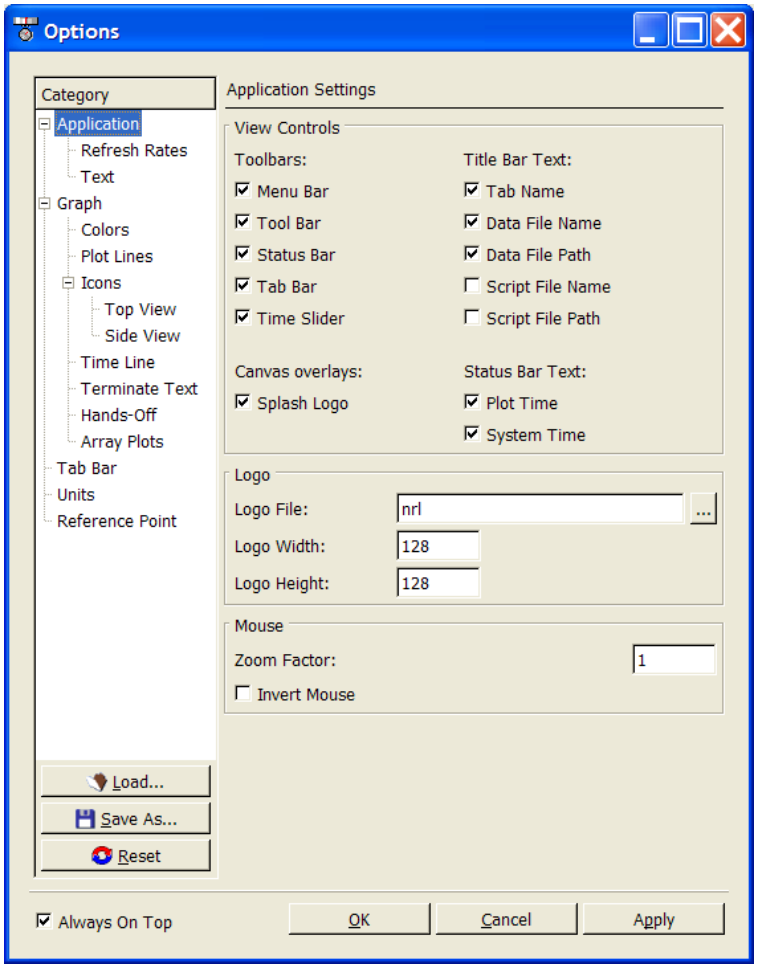

Figure 8.8: Options Dialog

Finally, the Reference Point category is worthy of note as if refers to Plot-XY's default reference point. This reference point is used in several calculations such as X-EAST Tangent Plane calculations. The point is specified in degrees and feet latitude, longitude, altitude. By default the reference point is set to the location of BARSTUR (Barking Sands Tactical Underwater Range) center. However, it can be modified here.

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Chapter 9

Reference Points

What are reference points and how are they used in Plot-XY?

Reference points are artificial tracks generated from user defined parameters. Although reference points enter Plot-XY as data from a file or over a network, unlike events and other data they can be changed and new ones can be created. There are two types of reference points: absolute and relative. Absolute reference points are static, persistent tracks that exist at a given position on the earth. On the other hand, relative reference points are positioned at a location offset from an entity might be moving. Thus, relative reference points can be mobile. A scenario may include any number of reference points, but each one must have a unique name. Reference points can be graphed or used in range calculations just like any other data.

9.1 Reference Point Manager

Reference points are created, modified and deleted using the Reference Point Manager (Figure 9.1). To create a new reference point edit the fields on the right side of the window, making sure the **Name** field is unique, and click the **Save** button in the bottom left corner. The list on the left changes to accommodate the new reference point. If the Name field is not unique, (a reference point with the same name appears in the reference points list) clicking the **Save** button will overwrite the existing point even if the point is not selected in the list.

9.2 Absolute Reference Points

Absolute reference points are points that are located at static geographic locations; they do not move. An absolute reference point can be defined in four different coordinate systems: LLA (Latitude, Longitude, Altitude), ECEF (Earth Centered, Earth Fixed), ECI (Earth-Centered Inertial), or TP (Tangent Plane). When defining a point in Tangent Place mode, the reference center is defined in LLA as specified in the **Ref. Lat**, **Ref. Lon**, and **Ref. Alt** fields (Figure 9.2).

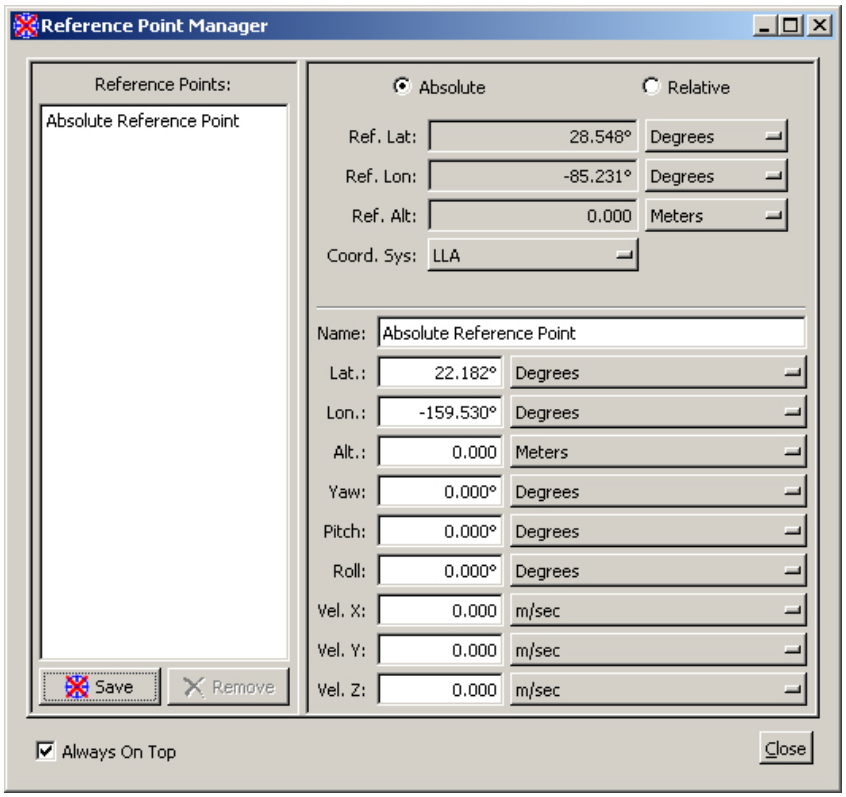

Figure 9.1: Reference Point Manager

Below the name field (remember the name must be unique even among absolute and relative reference points) are three position fields and corresponding units. These values change depending on the coordinate system (LLA, ECEF, ECI, or TP) and specify where the point is located on the earth.

The three orientation and three velocity fields are in an ENU (East North Up) LLA coordinate systems. Requests for the orientation or velocity fields will return the value provided in these fields.

9.3 Relative Reference Points

Relative reference points are defined relative to an entity's position. Each relative point is defined in an X-EAST tangent plan using the position of the entity as the origin of the tangent plane. The X, Y, and Z fields specify the offset from the entity's origin. To specify an entity, select it from the **Reference to Entity:** list. The orientation and velocity fields are in ENU LLA coordinate systems, similar to the absolute reference points.

Relative reference points can "attach" orientation values to the host entity. If a yaw, pitch, or roll value has an **Attach** button checked, then the value of the entity's corresponding field is added to the value provided in the dialog.

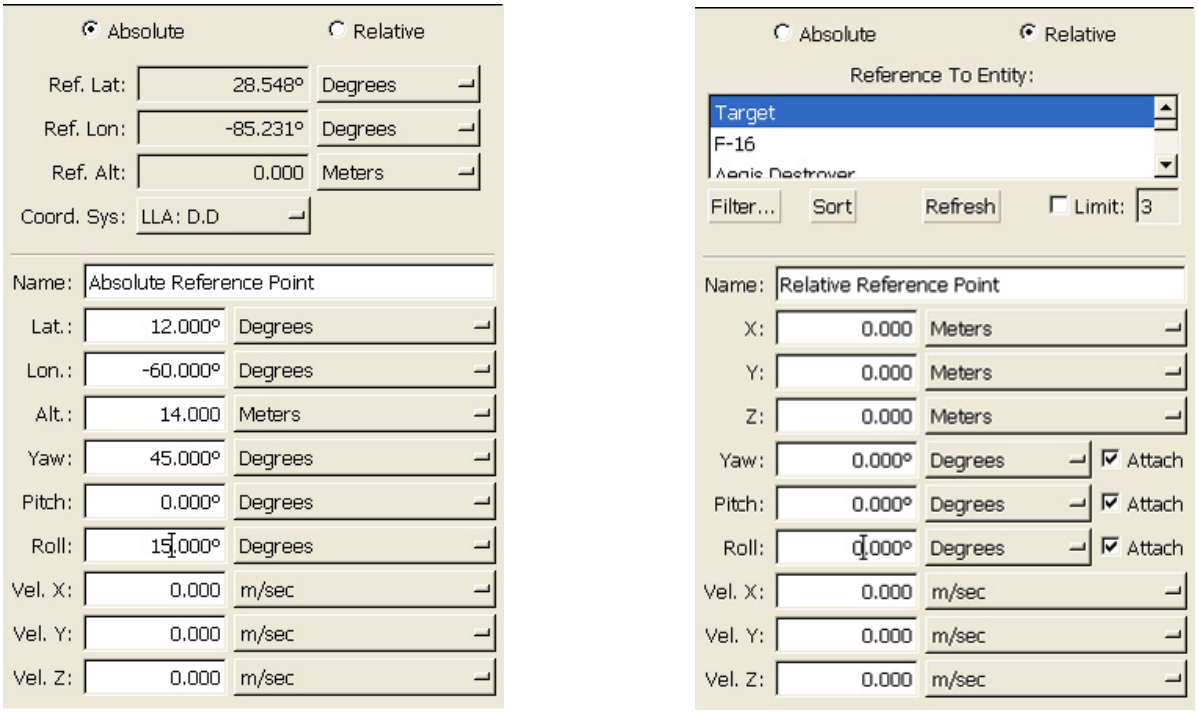

Figure 9.2: Absolute and Relative Reference Points

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Chapter 10

PML Configuration Scripting

What is a PML configuration script and how do I create one?

The configuration possibilities for Plot-XY are endless; plot spaces, plot pairs, data file, icons, colors, and layout can be organized in an infinite number of ways. Often Plot-XY display configurations are complex and must be ported to other computers quickly and easily. The PML configuration scripting functionality provides an easy manner in which to save the way data is displayed and, in some cases, the actual data source.

PML is an XML-like scripting format that provides for a strong and flexible method of saving even the most complex configurations. PML scripts can be saved and reloaded automatically with next to no effort. The human-readable scripts can be edited or tweaked by hand, or even created from scratch by using the schema document included with the Plot-XY distribution.

10.1 Saving and Loading Configurations

Saving and loading a PML configuration is an easy task. Once the Plot-XY data file, plot spaces, and plot pairs are set up, save the configuration by using the **Save to Script** option under the File menu. The **Load Script** option under the File menu is used to load PML configuration scripts. In other words, loading a script will set up the data file, plot spaces, and plot pairs just as it was saved.

The Save PML Configuration window appears when saving a script (see Figure 10.1). The window allows specific sections to be saved or not saved depending on the check boxes. Checked sections are saved, while unchecked or grayed-out sections are not saved. Sections are disabled (grayed-out) when no data exists in the application. For example, if the user has not created any reference points, then the reference points section is disabled.

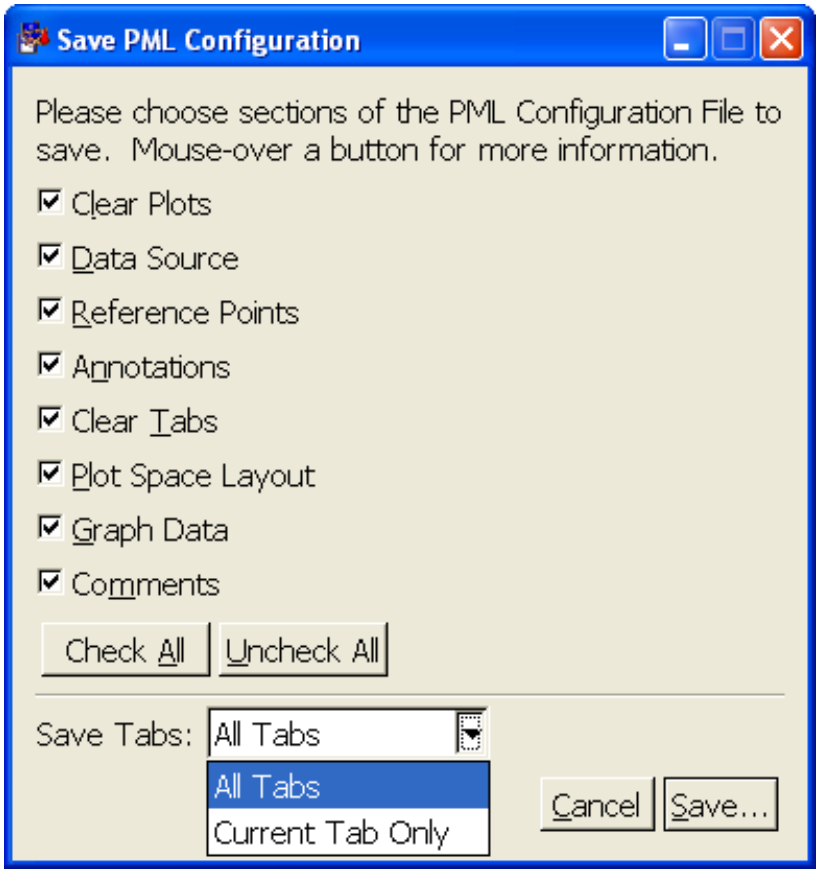

Figure 10.1: Save PML Configuration Window

For even further customization and control, include a line called **ScriptStartup** in the preferences file `myplotxy.prefs` like the following:

```
plot ScriptStartup "$(SIMDIS_HOME)/plotXYStartup.pml"
```

Adding this line identifies a PML script to load upon the start up of Plot-XY. In the case above the file is `plotXYStartup.pml` located in the $(SIMDIS_HOME) directory, but any file can be specified here. The ScriptStartup line in the preferences file provides a custom environment to use when starting Plot-XY so that configurations do not have to be manually opened every time Plot-XY is run. In other words, edit the preferences file so that every time Plot-XY is started the specific script of choice is used to configure the application.

10.2 Editing Configurations

In some cases it might be advantageous to tweak or modify a generated PML file (Figure 10.2). (PML files are generated when configuration scripts are saved.) Generally, a PML file will include every detail of the configuration complete with comments using standard XML comment blocks (`<!--comment-->`). The comments make a file easier to read and edit. Any field in the PML script

can be modified by hand using a standard text or XML editor.

```
- <xs:DataSource>
    <!--  Type can be "Network" or "File" (required tag)   -->
    <xs:DataType>File</xs:DataType>
    <!--  Data Reader; specifies the plug-in to use.  Try "ASI", "DCS'
    <xs:DataReader>ASCII Scenario Input File</xs:DataReader>
    <!--  Address to load; either filename, or IP address (required t
    <xs:DataAddress>$(SIMDIS_DIR)/BMD_Demo.asi</xs:DataAddress>
    <!--  Port to connect, if using a network connection   -->
    <!--  <xs:DataPort>0</xs:DataPort>   -->
    <!--  Protocol; "Unicast", "Multicast", or "Broadcast".   -->
    <!--  <xs:DataProtocol>None</xs:DataProtocol>   -->
  </xs:DataSource>
```

Figure 10.2: Part of a PML Script File

Tags in a PML file are prefixed by the text `xs:` because each tag belongs to the W3 XML standard namespace, `xs`. The colon indicates that the text before is a name of a namespace and the text to the right is a data element name. The tags for the PML are in a namespace in order to help verify PML files with an associated XML schema document. PML files can be verified automatically by many free COTS XMLS editor programs that support schema verification.

The general structure of the PML file cannot change. In other words, a `xs:DataAddress` tag is a child of an `xs:DataSource` tag, but an `xs:Classification` tag cannot have an `xs:DataAddress` tag. However, entire fields can be removed from a PML file. For example, the `xs:CreatePlotSpace` tag includes a tag, `xs:GridsHorizontal`, that specifies the number of horizontal grids in the plot space. The `xs:GridsHorizontal` tag and data can be removed entirely from the XML configuration file. If removed, the default number of horizontal grids, extracted from the current set of preferences, will be used.

Because preferences files can potentially change the interpretation of a script, a preferences file can be loaded before the PML file is parsed by using the `xs:LoadPreferences` tag.

Lastly, the `xs:LoadScript` tag can be used to daisy-chain together PML configuration scripts. In other words, another script can be loaded after the execution of the first script using the `xs:LoadScript` command.

10.3 Creating Configurations Using a Schema

As mentioned above, the PML file has a certain structure that must be maintained. In addition to the structure of tags, the data of each tag must be of a certain format. For example, the value

of `xs:MaxX` could be the number `100`, but cannot be the text string `foobar`. The field `xs:Visible` could be one of the boolean values `true` or `false`, but not the number `43`.

The Plot-XY XML Schema Document, `plotXY10.xsd`, provides the formats of the data values for all the tags in a PML script.

There are two ways to define the structure for an XML file. One way is to use a document type definition (DTD), while the other is to use a schema document. A DTD has the benefit that it is very easy to understand and create, but it cannot specify anything about the parameters for tags. Schemas, are more difficult to create and are less human-readable, but allow for stringent rules to specify formats for data parameters, as well as overall file structure.

The schema document is not meant to be very human-readable. It is also not meant to be editable. Schema documents can be loaded by XML editor applications to create, edit, or validate PML configuration files.

Each XML editor application is different. The PML configuration files include a reference to the schema document in the `xs:PlotXYScript` tag. Many XML editors will automatically try to find the schema document when loading XML configuration files. Others might require a direct association through a menu system. Refer to the application's documentation for the proper way to load and use a schema document.

A good editor will show the valid values or formats for each tag's data. For example, when changing the `xs:XFormat` field, an editor might display a list of the 42 acceptable enumerated values for the `X` format. Alternatively, when editing the `xs:XPrecision` field, a good editor would prevent the user from entering a negative number, where a standard text editor would not.

10.4 PML Configurations and Preferences Files

As mentioned above, PML files can load preferences files and the preference files can specify an appropriate startup script. PML configuration scripts and preferences files are different, however, and it is important to know the difference between the two.

A preference file includes a set of default options. When an object is created, Plot-XY looks to values in a preferences file to determine how to initially display the item. For example, a preference for `GraphAxisLineColor` specifies the color of an axis line for a plot space that has just been created. For a given plot space, the value can be changed through the Plot Space Manager, but when a new plot space is created the colors will be those specified in the preferences file.

The PML configuration files are thought of as scripts. A configuration file might initialize a data connection, then create plot spaces complete with data. A plot space created by a PML file will be initialized with values specified by the current preferences file, but the PML script also includes options to override the defaults. If a `xs:CreatePlotSpace` tag includes the child tag `xs:AxisColor`, the tag value will override the default specified by the preferences file.

In general, preferences files are like suggestions or initial values, where as PML configuration files specify actual values to use in specific instances.

Chapter 11

Plug-in Management

How do I manage Plug-ins in Plot-XY?

A plug-in is a program that is easily installed and used as part of another program in order to enhance capabilities and functionality. Plot-XY has a Plug-in API (application programming interface) that allows users to write plug-ins and use them with Plot-XY. After a plug-in is written, it can be loaded into Plot-XY in three different ways: via the application's Plug-in Manager, the preferences file, or the command line.

11.1 Plug-in Manager

The preferred (and usually the easiest) method to install a plug-in is via the Plug-in Manager. To access the Plug-in Manager, select the **Plug-in Manager...** menu item form the Plug-in Tools menu (Figure 11.1).

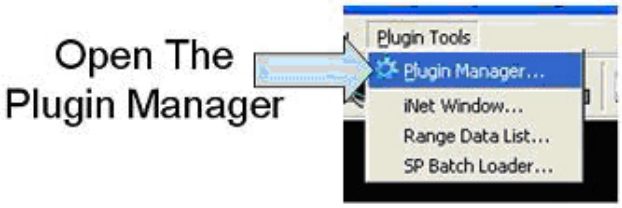

Figure 11.1: Opening the Plug-in Manager

The Plug-in Manager shows all plug-ins currently loaded in Plot-XY. Non-registered and registered are the two types of plug-ins that can be loaded into the application. Non-registered plug-ins can be loaded and unloaded from any location, whereas registered plug-ins are installed to a specific directory based on the system settings and are loaded automatically every time Plot-XY starts.

To load a plug-in for only one session of Plot-XY, click the **Load...** button in the bottom left corner of the Plug-in Manager (Figure 11.2). The plug-in will then be added to the non-registered

plug-ins list. To permanently add the plug-in to the application (for all sessions of Plot-XY), click the **Install New...** button. The plug-in will then be added to the registered plug-ins list.

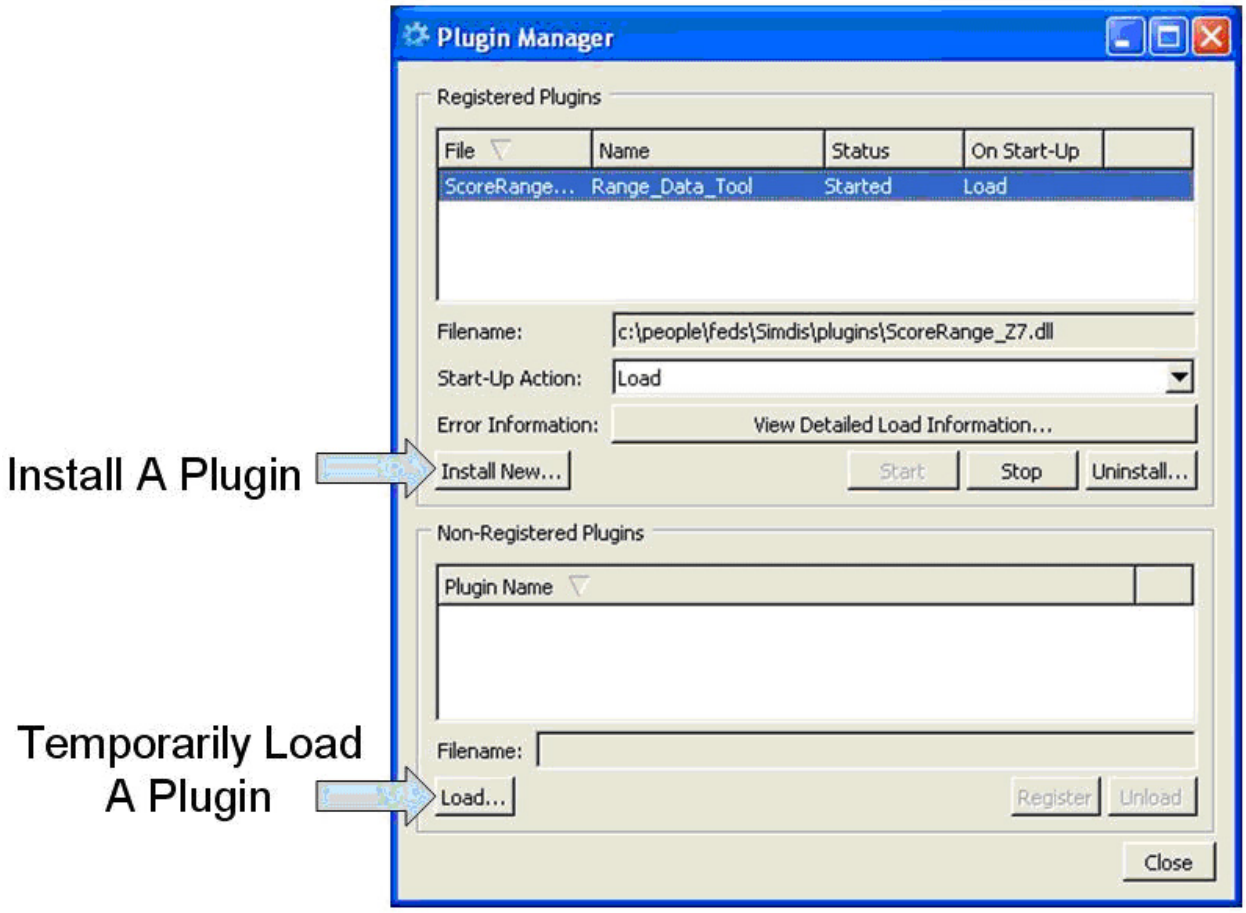

Figure 11.2: Loading Plug-ins

Registered plug-ins will always be loaded when Plot-XY starts up. Any plug-in loaded on the command line or through the preferences files that conflicts with a registered plug-in *will not* be loaded.

Once a plug-in is loaded, it might create menu items in the Plug-in Tools menu.

11.2 Preferences File

The second most reliable method of loading a plug-in is through a Plot-XY preferences file. Although a Plot-XY preferences file already exists at `$SIMDIS_HOME)/plotxy.prefs`, it is highly recommended that a custom preferences file named `myplotxy.prefs` be created in the same directory. This is because new Plot-XY installations will overwrite previous `plotxy.prefs` files, but not `myplotxy.prefs`. The `plotxy.prefs` file will attempt to load a `myplotxy.prefs` file if one exists.

When Plot-XY is started, after the preferences files have been modified, the console shows whether preferences were loaded successfully as shown in Figure 11.3.

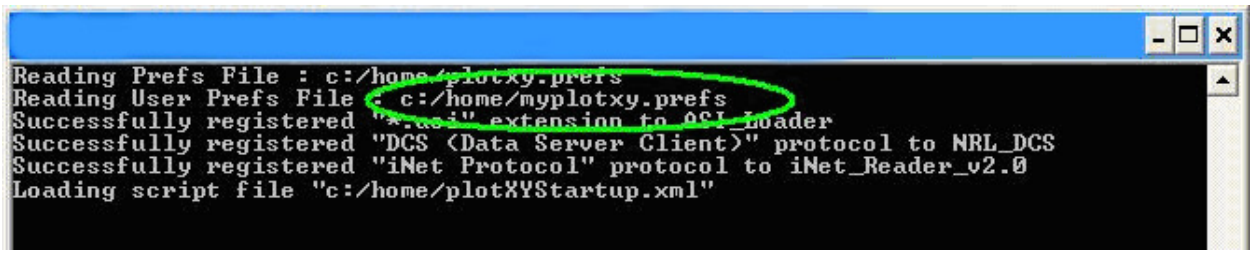

Figure 11.3: Plot-XY Console

To automatically load a plug-in when Plot-XY starts, add the line `plot Plug-in File <plug-in file name>` to the preferences file as shown in Figure 11.4.

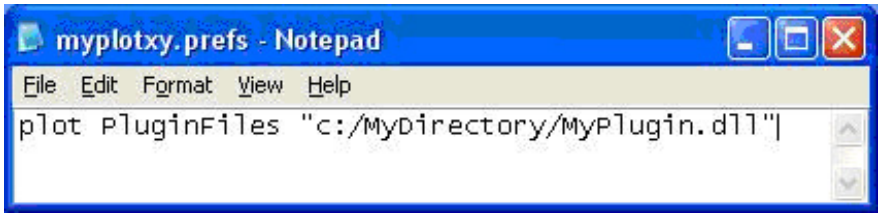

Figure 11.4: Example Preferences File: `myplotxy.prefs`

If a plug-in is already installed as a registered plug-in, then loading the same plug-in through the command line will issue a warning to the console and the plug-in will not be loaded.

11.3 Command Line

Plug-ins can also be loaded via the command line. The command line argument `-plug-in` specifies a plug-in to load. For example:

```
PlotXY -plug-in ./MyDirectory/MyPlugin.dll
```

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Appendix A

Hot Keys

Menu	Action	Hotkey
File	Open File	Ctrl+O
File	Load Script	Ctrl+L
File	Save To Script	Ctrl+S
File	Save Screenshot	Ctrl+Shift+S
File	Quit	Alt+Q
File	Quit	Alt+F4
Edit	Undo	Ctrl+Z
Edit	Redo	Ctrl+Y
Edit	Cut	Ctrl+X
Edit	Copy	Ctrl+C
Edit	Paste	Ctrl+V
Time	Play	P
Time	Play Reverse	Ctrl+D
Time	Toggle Real Time	Shift+R
Time	Time Controls	Alt+T
Time	Toggle TCS Client	Alt+X
Time	Toggle TCS Server	Shift+X
Graph	Plot Manager	Ctrl+M
Graph	Autofit	F
Graph	One to One	O
Graph	Round Ranges	R
Graph	Options Dialog	Ctrl+Alt+O

Menu	Action	Hotkey
Graph	Shift Axis Up	PgUp
Graph	Shift Axis Down	PgDn
Graph	Shift Axis Right	End
Graph	Shift Axis Left	Home
Graph	Previous Plot	Shift+Tab
Graph	Previous Plot	Shift+Space
Graph	Next Plot	Tab
Graph	Next Plot	Space
Data	Add Plot Pair Window	Ctrl+A
Data	Reference Points Window	Ctrl+R
Data	Track Status Window	Ctrl+Alt+S
Data	Flush Data	Ctrl+Alt+Shift+F
Tabs	New Tab	Ctrl+T
Tabs	Close Tab	Ctrl+F4
Tabs	Next Tab	Ctrl+Tab
Tabs	Previous Tab	Ctrl+Shift+Tab
Tabs	Select Tab By Number	[1-9,0]
View	Show Menubar	Ctrl+Alt+M
View	Show Toolbar	Ctrl+Alt+C
View	Show Statusbar	Ctrl+Alt+B
View	Show All Bars	Ctrl+B
View	Show Plot Time	Ctrl+Alt+P
View	Show System Time	Ctrl+Alt+Y
View	Show Frame Rate	Alt+F
View	Full Screen	Shift+F
View	HotKeys	Ctrl+H
Plugin Tools	Plugin Console	Ctrl+F1
Help	Contents	F1
Open Recent	Open Recent Script 1	Ctrl+Alt+Shift+R
Order	Bring To Front	Ctrl++
Order	Send To Back	Ctrl+-
Order	Bring Forward	+
Order	Send Backward	-

Appendix B

Plug-Ins

B.1 ASI Plug-in

The Plot-XY ASI plug-in reads SIMDIS ASCII Scenario Input (ASI) files and passes the data to Plot-XY in scenario format. The plug-in automatically registers itself with the Open dialog in the File menu, and has no user interface.

B.2 DCS Plug-in

The Plot-XY DCS plug-in will connect to a SIMDIS Data Client Server (DCS) server and pass the scenario information to Plot-XY in live mode. The plug-in uses a DCS2 Server Discovery engine to automatically locate servers on a LAN, and servers can be manually located by entering its address into text fields.

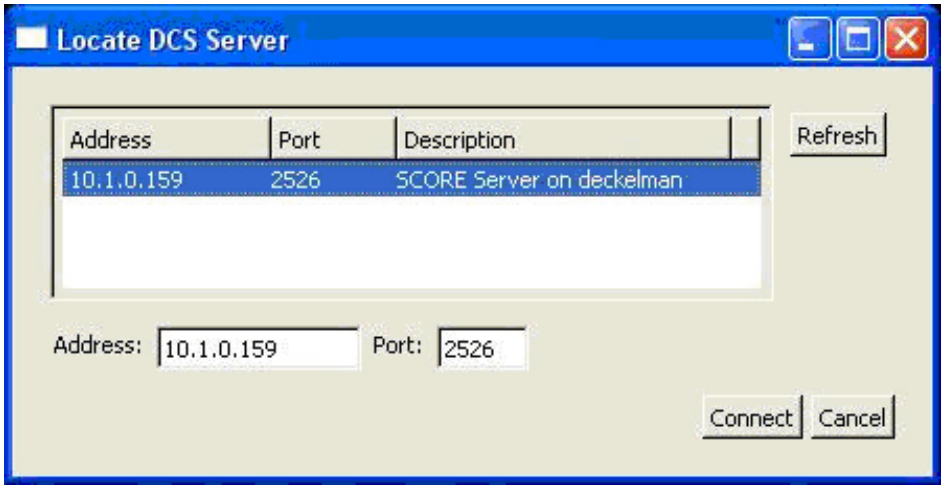

Figure B.1: Locate DCS Server Window

The DCS Interface window (Figure B.1) can be opened by selecting **DCS (Data Server Client)** option in the Open Network menu of the File menu, if the DCS Plug-in is loaded in Plot-XY. In this window, the **Refresh** button will send a multicast locate request to which DCS servers may automatically respond, for finding local area network DCS servers. Clicking the **Connect** button will start the data feed.

B.3 SuperPlot Plug-in

SuperPlot is the name of the plotting program which SIMDIS used to distribute and for which Plot-XY is a replacement. As such, a plug-in has been written to support legacy formats that SuperPlot could load.

The Plot-XY SuperPlot plug-in reads various SuperPlot format files and passes the data to Plot-XY in a number of formats. The plug-in automatically registers itself with the Open dialog in the File menu, and has a small user interface.

The plug-in supports the following legacy SuperPlot formats: ASCII SuperPlot file (`*.asp, *.plot`), Binary SuperPlot file (`*.bsp, *.binplot`), SuperPlot Time Slice files (`*.asg, *.bsg, *.graph, *.bingraph`), and SuperPlot Time Slice Blocks (`*.bsb, *.binblock`). Many of these files can be loaded up through the file menu. However, the plug-in also supports batch file loading through the Graph Batch Loader window (Figure B.2).

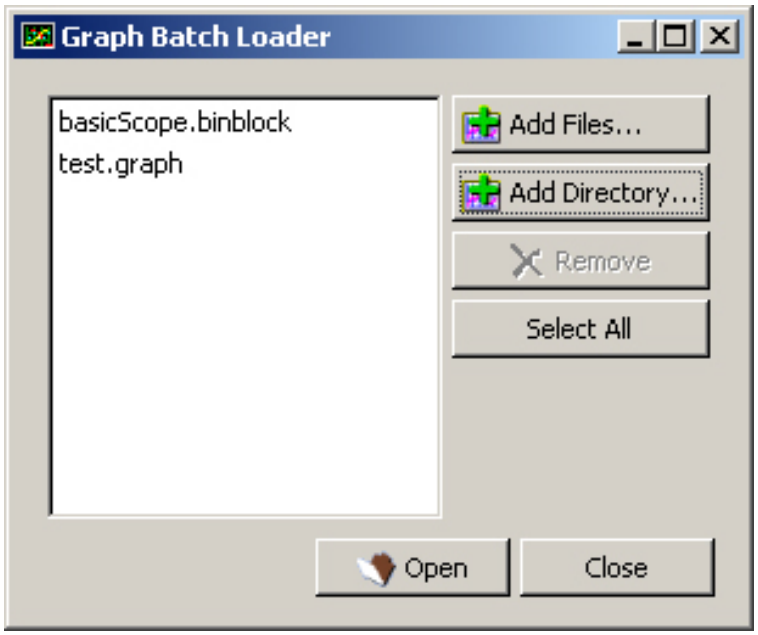

Figure B.2: SuperPlot Graph Batch Loader Window

This window can be accessed through the **SP Batch Loader...** menu item in the Plug-in Tools menu in Plot-XY when the plug-in is loaded. This window can be used to load multiple time slice files at one time. This is often useful for loading in A-Scope or RTI data. Files can be added and removed from the window individually. Additionally, entire directories can be added to the list by using the **Add Directory** button. The files are actually loaded into Plot-XY when the **Open** button is clicked.

B.3.1 SuperPlot Formats Overview

Using the SuperPlot plug-in is the recommended way to get non-TSPI X-Y data into Plot-XY, as it supports generic X-Y data formats. The SuperPlot plug-in supports a number of different formats that can be separated into two groups. One group is similar to comma-separated value files and includes a typical setup of data columns against some time value. The second group of file types is used to form A-Scope and RTI graphs, and include entire graphs in separate time slices. The first type will be referred to as columnar data formats and the second type as array data formats.

B.3.2 Columnar Data Formats

Columnar data formats include the ASCII and Binary Plot and SuperPlot file types. ASCII SuperPlot files, with the extension `*.asp`, are useful for plotting data with a network format (nothing known until data is read). Each line represents either a header or plot data. The header consists of the keyword Plot, followed by an ID, a label, and each column's sub label. The SuperPlot plug-in creates an 'object of the name of the first label, with parameters corresponding to each successive column label. Data lines consist of the corresponding plot ID, and data corresponding to the appropriate column header. Plot IDs are non-zero positive integers, and headers must come before matching data. All data is graphed against the 0th column, which is `''Time (sec)''` in Figure B.3.

The `.plot` file format is an older ASCII format for a fixed number of columns. Comments can be declared using two slashes (//). The format is described below. The following fields are not applicable in Plot-XY and therefore ignored (but still required): X Label, Y Label, xmin, xmax, ymin, ymax. The `''plot x label''` is used as the name of a graph-able parameter in Plot-XY.

The binary version of the plot file uses the extension `*.bsp` or `*.binplot`. Binary files are typically smaller and have better precision than text ASCII files. The format is almost exactly the same as a .plot file, except in binary. Integers are 32 bits, and strings consist of an integer describing the length of the string followed by the string itself.

```
Plot 5 "Plat 5" "Time (sec)" "WGS-84 X (ft)"  "WGS-84 Y (ft)"  "WGS-84
Z (ft)"
5 27026700 -18182471 -6586745 7966172
Plot 2 "Plat 2" "Time (sec)" "UTM X (m)"  "UTM Y (m)"  "UTM Z (m)" "Lat
(deg)"  "Lon (d)"  "Alt (m)"
2 27026700 -10376.88835371782 45558.41497124205 -98.3460871418938
22.5308689478328 160.0200741637046 -98.3460871418938
Plot 1 "Plat 1" "Time (sec)" "WGS-84 X (ft)"  "WGS-84 Y (ft)"  "WGS-84
Z (ft)" "UTM X (m)"  "UTM Y (m)"  "UTM Z (m)" "Lat (deg)"  "Lon (d)"
"Alt (m)"
1 27026701 -18171948 -6634126 7949872 -2540.29866161688
39470.80169782197 -181.8180495826527 22.4758927944023 -
159.9441201528005 -181.8180495826527
5 27026701 -18182481 -6586741 7966187
1 27026703 -18171959 -6634122 7949852 -2542.599618466976
39464.12465966018 -181.6246144492179 22.47583249525747 -
159.944142454198 -181.6246144492179
2 27026704 -10390.41733461585 45559.68047305775 -98.21495158690959
22.53088037635476 -160.0202052896667 -98.21495158690959
1 27026705 -18171969 -6634117 7949833 -2545.082829708 39457.87867929057
-181.6758040385321 22.47577608891894 -159.9441665220465 -
181.6758040385321
```

Figure B.3: Example `.asp` File

```
(int)              // #plots

(string)           // X Label
(string)           // Y Label

(string)           // plot 1 label
(string)           // plot 2 label
   .
   .
   .
(string)           // plot n label

(float) (float)    // xmin xmax
(float) (float)    // ymin ymax

(float) (float) ... (float)   // x1 plot1y1 ... plotny1
(float) (float) ... (float)   // x2 plot1y2 ... plotny2
   .
   .
   .
(float) (float) ... (float)   // xm plot1ym ... plotnym
```

Figure B.4: `.bsg` File Format

B.3.3 Array Data Formats

Array data formats describe entire graphs in separate time slices. Plot-XY cycles through the time slices like a slide show. The array formatted data can only be shown in A-Scope or RTI plots. The Graph file format only includes a single time slice, while the BinBlock format allows for multiple time slices in one file.

The Graph file format represents a single time slice. Multiple graph files (extension `.graph` or `.asg` for ASCII, `.bingraph` or `.bsg` for binary) can be loaded at once through the SuperPlot Batch Loader window, described above. Each file includes a unique time index at the top. Colors are specified in hex in the format `0xAABBGGRR`, with `AA` as 2 hex digits `0x00-0xFF` of alpha, `BB` is the blue component, `GG` is the green component, and RR is the red component. For example, `0xff00ffff` represents yellow (full alpha, green, and red). The format also allows for a number of range gates. Range gates are drawn as rectangles in Plot-XY on A-Scope plots in the appropriate color. As with plot files, certain fields are not applicable and are ignored (but still required): units and draw type.

There are two version of the graph format. In version 1, the coordinates for the range gate correspond to a index range in the data. For example, the start could be `4` the center might be `8`, and the end might be `14`, corresponding to the 4th, 8th, and 14th data point in the data list. In version 2, the range gate coordinates are actual range values and not indices. Needless to say, this makes defining gates much easier on the end user. The format of the file in ASCII and binary is shown in Figure B.5.

The binary block format, in `.bin` block files, multiple time slices can be included in one file. The format is in binary as shown in Figure B.6.

```
(float)             // time index
(int)               // # plots
(string)            // x label
(string)            // y label
(int)               // units - unused
(int)               // version #
for (# plots)
{
  if (version == 1)
  {
    (int)           // # gates
    for (# gates)
    {
      (int)         // drawtype (0: solid, 1: wireframe)
      (ulong)       // gate color (hex: 0xAABBGGRR)
      (string)      // gate description
      (int)         // gate start index if version 1, start value if
version >= 2
      (int)         // gate center index if version 1, center value if
version >= 2
      (int)         // gate end index if version 1, end value if
version >= 2
    }
  }
  (int)             // number of coordinates
  (string)          // plot label
  for (# coordinates)
  {
    (float[2])      // coordinates (for ascii,
  }                 // use (float) (float) instead)
}
```

Figure B.5: ASCII and Binary File Format

```
(int)               // # plots
(string)            // x label
(string)            // y label
(int)               // version #
for (# plots)
{
  (float)           // time index
  (int)             // # gates
  for (# gates)
  {
    (int)           // drawtype (0:solid, 1:wireframe)
    (ulong)         // gate color (hex: 0xAABBGGRR)
    (string)        // gate description
    (int)           // gate start index if version 1, start value if
version >= 2
    (int)           // gate center index if version 1, center value if
version >= 2
    (int)           // gate end index if version 1, end value if
version >= 2
  }
  (int)             // number of coordinates
  (string)          // plot label
  for (# coordinates)
  {
    (float[2])      // coordinates
  }
}
```

Figure B.6: Binary Format `.binblock`

Appendix C

Troubleshooting

This appendix is intended to assist with troubleshooting problems that might occur during typical operation of Plot-XY.

C.1 Application Fails to Start

A message box pops up saying Plot-XY cannot find XXXXX.dll

Either a system file is missing, or the Plot-XY installation was corrupted. Try reinstalling the application. Under UNIX, this can happen if standard system libraries are not installed or up to date. Run the `ldd` command on the Plot-XY executable, and download and install the appropriate missing packages or RPMs from an operating system support website.

It seems to read a preferences file, then quits with an unhandled exception.

Incompatible plug-ins are a common cause of this problem. Try editing the preferences file and the user preferences file by hand to comment out all references to plug-ins (the # sign starts a comment). If the application successfully starts, try adding plug-ins one at a time until the one that causes the exception is found. Contact the vendor of the plug-in to retrieve an update.

C.2 Errors After Application Start

The application starts but displays a blank screen, or displays a set of axes with no text.

Most likely problem is that the `SIMDIS_HOME` and/or `FONT_PATH` environment variables are not set. This can be verified by opening the About window in the Help menu, and checking the values of `FONT_PATH` and `SIMDIS_HOME`. If running under UNIX, be sure to start the application with the `runPlotXY` shell script from the proper directory. This sets the environment variables relative to where the script is executed. If this does not fix the problem, or the problem occurs under Windows, try reinstalling the application.

After recently adding a new plug-in, the application crashes sporadically.

Try to remove the plug-in from the configuration files. If this fixes the problem, contact the vendor of the plug-in.

Graphics appear discolored, irregular, or inconsistent.

Try to update the graphics drivers. Plot-XY should be run in 32-bit color for best performance.

The screen updates very slow, even with a small data file and limited number of plot pairs.

Try to update the graphics drivers. Running in less than 32-bit color can also cause this problem. If running in Windows, check the About window in the Help menu. If the OpenGL renderer is Microsoft GDI, then the graphics drivers are using software acceleration for OpenGL, which can be very slow. Try to update the graphics drivers to use native OpenGL hardware acceleration.

Any erratic behavior or repeatable actions that cause the software to exit with an unhandled exception should be reported on the unclassified SIMDIS JIRA Bug and Issue Tracking website. If a question is not answered here, feel free to post to our JIRA bug tracking forum for more assistance.